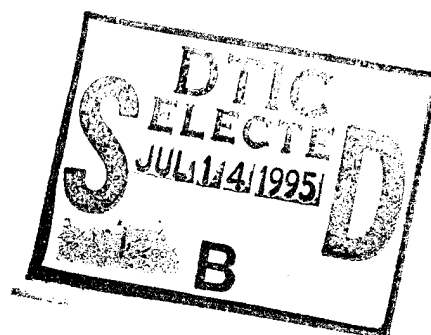




Research Product 95-08

Methodology for the Development of Structured Simulation-Based Training



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Armored Forces Research Unit
Training Systems Research Division

U.S. Army Research Institute for the Behavioral and Social Sciences

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A Field Operating Agency Under the Jurisdiction
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EDGAR M. JOHNSON
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FOREWORD

Reserve Component units have an increasingly important role in the force mix. These units continually face the challenge of training within time and resource limitations. To help meet this challenge, Congress provided Fiscal Year 1993 research and development funding for the establishment of a Reserve Component Virtual Training Program (RCVTP) at Fort Knox, Kentucky. The intent of this program is to provide structured, compressed training focused initially on Army National Guard (ARNG) armor units, making innovative use of available simulation technologies.

The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI), the Advanced Research Projects Agency (ARPA), the National Guard Bureau (NGB), the U.S. Army Armor Center (USAARMC), and Fort Knox joined efforts (Memorandum of Agreement entitled "National Guard Armor Simulation Center," April 1993) to develop and implement the RCVTP. The ARI-Armored Forces Research Unit at Fort Knox accomplished training research and development for the RCVTP through a contract effort entitled "Simulation-Based Multiechelon Training Program for Armor Units (SIMUTA)," as part of the Research Task entitled "Strategies for Training and Assessing Armor Commanders' Performance with Devices and Simulations (STRONGARM)."

This Research Product outlines a methodology for developing structured simulation-based training. The methodology is based on experience in developing platoon, company, battalion, and battalion staff exercises for the RCVTP. Validation of the methodology was accomplished in the extension of the RCVTP to include cavalry troop exercises. In its application, the development methodology is not specific to any particular simulation, type of unit, unit level, or mission. It is designed for use by training developers and presents step-by-step guidance, as well as examples and illustrations, for constructing structured training programs for simulation environments. The information in this Research Product has been provided to training developers and RCVTP observer/controllers (O/Cs) at Fort Knox to guide further development of simulation-based training.

EDGAR M. JOHNSON
Director

METHODOLOGY FOR THE DEVELOPMENT OF STRUCTURED SIMULATION-BASED TRAINING

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METHODOLOGY FOR THE DEVELOPMENT OF STRUCTURED SIMULATION-BASED TRAINING

SECTION 1. INTRODUCTION

Purpose

The purpose of this methodology is to provide guidance for development of structured simulation-based training exercises. It is a step-by-step procedure based on the work performed in designing and developing the Reserve Component Virtual Training Program (RCVTP) materials and scenarios. The methodology itself is not specific to any particular technology, type of unit, unit level, or mission. It is, however, most applicable to the development of collective training exercises that focus on tactical skills.

The RCVTP has been developed for the use of U.S. Army National Guard (ARNG) units, to provide them with high-quality, time-compressed structured training in a virtual and constructive environment. Both offensive and defensive exercises are included for the battalion and staff level (armor battalion, battalion task force, and battalion staff), company level (armor company, company team, and cavalry troop), and platoon level (armor platoon, mechanized infantry platoon, and scout platoon). For the staff, exercises use either Janus (constructive simulation) or the Commander/Staff Trainer (C/ST, automated staff workstation) as the behind-the-scenes driver; all other exercises are implemented using Simulation Networking (SIMNET) technology.

Two major products have come out of the RCVTP development work: the training support package and specification of the methodology for developing such training. The training support packages for the RCVTP include printed materials for pre-training preparation, exercise selection, exercise implementation/execution, after action reviews (AARs), and take-home report packages; computer files on SIMNET and Janus that initialize and control the exercise; and training for the designated trainers¹ who use the materials to monitor units, control the process, and provide feedback.² An additional product is this methodology description, which details the process for designing and developing similar training support packages.

The methodology for development of structured simulation-based training is designed for use by training developers. Subject matter expertise for the selected technology and for associated military aspects (e.g., the mission type, unit type, operations, and enemy tactics) will be required throughout the development process.

¹ The term "observer/controller," or O/C, is frequently used to denote individuals who are responsible for guiding the training, monitoring performance, and providing feedback. O/Cs are usually military personnel, often part of a dedicated training cadre, but are sometimes members of the unit doing the training. In this methodology guide, the term "observer/controller/interactor" or "O/C/I" is used more generically to refer to whoever will be responsible for observing and guiding the training for the unit.

² Additional information concerning RCVTP development can be found in *Developing the RCVTP: History and Lessons Learned* (Hoffman, Graves, Koger, Flynn, & Sever, 1995).

Structured Training Characteristics

The methodology is characterized by its emphasis on deliberate, purposeful building of training that takes advantage of simulation capabilities. The exercises provide for a focus on critical tasks in a planned sequence of performance that reinforces learning and builds on prior experience. The training is embedded in the context of tactically realistic scenarios, causing the unit to be immersed in the tactical situation. The training can be directed to a single echelon, or training for several echelons can be linked by means of common scenarios. In either case, the structure serves to maximize the training value for all personnel.

Structured simulation-based training has two distinguishing characteristics: It focuses on specific training objectives in a deliberately-constructed training strategy, and it takes full advantage of instructional design principles and simulation capabilities to provide training that is both efficient and effective.

The training focus is provided by means of careful attention to standardization and doctrinal guidance, and is accomplished by adhering to the following guidelines:

- The exercises should be developed for a selected METT-T (mission, enemy, terrain, troops, time available). This means that
 - The exercises should focus on a selected unit type and level and on a selected mission type.
 - The mission scenario must be appropriate for the training unit level and for two levels up.
 - The enemy should fight according to documented tactics.
 - The scenario should take place on selected terrain.
- The exercises should use documented task sources (such as Army Training and Evaluation Program Mission Training Plans (ARTEP-MTPs) and Field Manuals (FMs)) for the selected unit type and mission type.

Simulation capabilities and instructional design principles can be used to produce effective and efficient training if certain guidelines associated with training development theories are followed:

- The exercises should take advantage of and work within the capabilities of the selected simulator/simulation.
- The exercise materials that are produced should result in a training program that is turn-key for the unit; that is, the unit's focus should be on participating in the training, rather than on designing, developing, and administering the training.

- The exercises should support a selected training sequence with regard to task difficulty (e.g., crawl-walk-run, natural order).
- Performance of each task should be required more than once in order to reinforce learning.
- The observer's attention should be directed, at any point in time, to a limited number of key training objectives.
- The program should be designed to fit within a unit's time and personnel constraints.
- The training program should utilize observers, controllers, and/or interactors (O/C/Is) who are trained to control the exercise, operate the simulator/simulation, and provide feedback and coaching throughout and after the training.

Training Support Package Products

The typical products of a structured simulation-based training development project include

- Preparation materials for the unit. These assist unit leaders in selecting the appropriate level of training for their training needs, and give guidance in home station preparation for the simulation-based exercises. Such materials include descriptions of the exercises, recommended manning levels for participation in the training, operations orders (OPORDs) and other mission-specific materials to be used in home station training and rehearsals, and guidance on how to conduct such training.
- Execution materials for the observers, controllers, and interactors. These include administrative materials for conducting the training and controlling the unit, observation materials for directing attention to specific task performances, instructions for operation of the simulation components, and guidance for interacting with the unit during the exercise.
- Training performance feedback materials. These are recording forms and guidelines used in the delivery of AARs.
- Summary report materials. These materials provide the structure for giving feedback to the unit leadership on the overall training experience, including a summary of skills improved during the training and skills that need further attention.

Contents of this Methodology Guide

This section of the methodology, *Introduction*, contains a description of the methodology and a discussion of the characteristics of structured interactive training.

Sections 2 and 3 present generic guidance on the methodology. Section 2, *Overview of the Methodology*, contains a discussion of the methodology approach, delineating its relationship to the Systems Approach to Training (SAT) (Department of the Army, 1988d). Section 3, *Using the Methodology*, contains detailed guidance on the use of the methodology, not specific to any technology, mission, or unit type. It lists the activities to be followed in developing the scenarios and materials, indicates where revision loops occur, details review and tryout requirements, and describes the products from each activity and how they feed into subsequent activities.

Section 4, *Observer/Controller/Interactor Training*, addresses both qualifications and training of the trainers. The guidance is neither prescriptive nor exhaustive. Every application of the methodology will differ with respect to the roles and responsibilities of the O/C/Is, and their selection and training must be correspondingly flexible. Section 4 contains considerations and advice concerning what that training can or should cover.

The final section, *Using the Methodology for Training Program Modifications*, discusses various topics related to the development methodology, including extension of existing exercises to other METT-T and description of ongoing efforts to validate and refine the methodology.

Appendix A contains a job aid version of the methodology, in the form of an outline. Several of the activities require documentation or production of materials. Where possible, worksheets have been designed to aid in preparation and quality control. Blank worksheets are provided in Appendix B of this methodology manual.

Appendix C contains discussion and examples of how the activities were performed in developing the RCVTP. The process for each echelon is discussed in those sections, as follows:

- Part 1, *Platoon-Level Training*
- Part 2, *Company-Level Training*
- Part 3, *Battalion-Level Training*
- Part 4, *Battalion Staff Training*

SECTION 2. OVERVIEW OF THE METHODOLOGY

The methodology for developing structured simulation-based training exercises follows the SAT model. The SAT process comprises five phases:

- *Analysis* -- to determine the training requirement, training audience, and appropriate training media.
- *Design* -- to prepare the specifications of the training components.
- *Development* -- to construct and to refine the various training package components.
- *Implementation* -- to deliver the training in an operational setting.
- *Evaluation* -- to assess success in achieving the program's training goals.

The development methodology described here parallels the SAT process in most respects; however, the activities within the SAT phases have been narrowed to focus on the development of structured training using simulators and simulations. The methodology concentrates primarily on *Analysis* (including certain initial decisions and selection of training objectives), *Design* (including other initial decisions and specification of the exercise limits), and *Development* (construction of package components, tryouts, and formative evaluation).

As shown in Figure 1, there are four phases to the development methodology:

- *Phase 1: Initial Decisions* -- to determine the training requirement (mission and enemy type, terrain, time constraints, number of exercise start points, difficulty level), training audience (unit type or echelon, personnel within unit), and appropriate training media (simulator/simulation).
- *Phase 2: Select Training Objectives* -- to focus the training on critical tasks and performance standards in support of the training requirements, and to ensure that those tasks can be performed in the selected simulator/simulation environment.
- *Phase 3: Design Scenario and Exercise Outline* -- to determine the limits of each exercise with reference to mission, enemy, and terrain; generate the tactical framework for the exercises; specify the events within each exercise; define and put substance to the roles to be played by controllers, interactors, or automated components; and delineate the connections between exercises and training objectives.
- *Phase 4: Develop Training Support Package* -- to construct and try out all of the written and simulator/simulation-based components of the training program, including materials for the O/C/Is and for the participating unit.

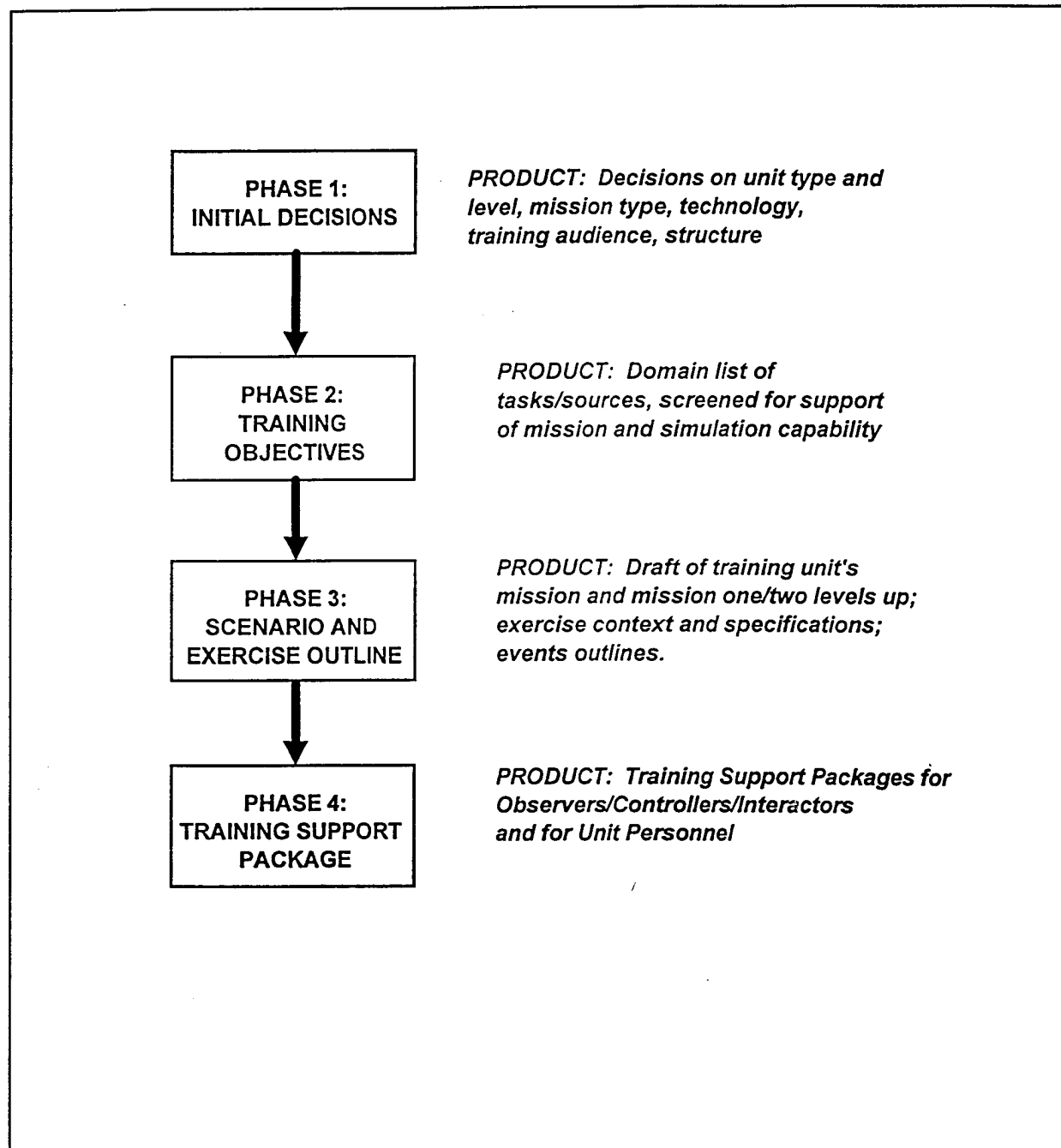


Figure 1. Phases and activities in the methodology for development of structured simulation-based training.

The SAT *Implementation* and *Evaluation* phases are not explicitly replicated in the development methodology. Both implementation and the summative evaluation take place after the activities covered by the methodology, when the training package is received by the user.

The development methodology does, however, incorporate a series of required formative evaluations throughout the development process. These activities may take the form of map exercises, trials with representative or nonrepresentative units and individuals, technology-driven trials, or content reviews with experts and interested parties. Their purpose is to insure the quality of the product by attending to quality throughout development; they are intended to direct attention to training utility as well as to technical content. In each of the activities in the methodology, they are presented under the general heading of "Quality Review." Each quality review step has a specific focus, appropriate to the development phase, and the information gathered is used to revise and refine products or to ensure the accuracy and usability of the products.

SECTION 3. USING THE METHODOLOGY

This section is addressed specifically to the training developer who is using the methodology to construct structured training. The explanations in this section provide information, directions, and suggestions for use during development; they are designed to be used with the methodology outline in Appendix A and the worksheets in Appendix B. Application discussions are presented in Appendix C.

The Methodology Outline (Appendix A)

The outline in Appendix A presents the four phases in the methodology, and, for each phase, the *Activities* that are to be performed in the required analysis, design, and development. The 10 activities should, in general, be performed in the order shown. However, the process is not meant to be rigid; often, the work on an activity will cause you to go back and revise the products of an earlier activity. In fact, you should regard the process as flexible, and be prepared to move back and forth between activities during the development, revising decisions and products as necessary.

For each of the activities, the outline in Appendix A indicates:

- *Product* -- In most cases, the product is no more than the completion of a worksheet (or a portion of one), which you should retain as part of the record for the development effort. In other cases, the product is a transition item, where you should be making notes, sketches, or preliminary plans. These products serve to guide your thinking and have no formatting requirement.
- *Input From* -- Identifies the product or products from earlier activities that are used in creating this product.
- *Input To* -- Identifies the later activity or activities in which the product of this activity is used.
- *Revise To* -- Identifies the activity or activities performed earlier that may need revision as a result of your thinking on this activity.
- *Quality Review* -- Identifies the type of tryouts and/or expert reviews that should be conducted as part of the continued quality assurance process and formative evaluation.

The first time you develop training using the methodology, you should work directly from this section, *Using the Methodology*. It contains a wealth of detail about the activities--how to make decisions and revisions and how to bring together the products of several activities. It will also walk you through the use of the worksheets in Appendix B. You should refer to the examples in Appendix C, where some of the products are discussed for the RCVTP development for platoon, company, and battalion level on SIMNET, and for battalion staff using Janus.

For future development efforts you will probably work from the outline in Appendix A. Eventually, you may find that the job aids in Appendix B are all you need, along with only an occasional reference to this section to remind you of the reasons for the requirements on the worksheets.

As you proceed through the development activities, you will often find that many earlier decisions or products are changed based on later decisions and activities. ***Whenever decisions or products are revised, you must correct the earlier product***, whether that product is a worksheet or a piece of the training support package. We cannot emphasize too strongly the importance of keeping all of the products current and in agreement with each other.

Methodology Job Aids (Appendix B)

Appendix B contains several worksheet job aids that you should complete as you develop the training exercises. They are not themselves used in the training, but they serve to document decisions and force you to direct your efforts towards the consistency that is required for the development of structured training. Additionally, they provide continuity for other developers. The worksheets, when completed, should be maintained as part of the record for development of the training.

The checklists in Appendix B are designed to help you maintain high quality in the exercise materials. They list the characteristics that you should look for to ensure that the training materials are correct and complete.

Before you begin development, make copies of the worksheets and checklists and put them in a safe place, so that you always have a set of masters.

Application in the RCVTP (Appendix C)

Appendix C provides some descriptions of how the methodology was applied in developing platoon, company, battalion, and battalion staff training. The discussion and examples are intended to clarify how the methodology is used and what the products are.

Quality Review

An additional explanation of the "Quality Review" step is in order at this point. The various types of quality reviews are designed to provide useful information appropriate to each stage of development. They form a concentric series of increasingly wide circles of interest, from the basic decisions, through the development of supporting pieces of the exercises, to actual materials in the training support package. The quality review activities will draw your attention to the many ways that the materials must be carefully checked, verified, and corrected.

For Phase 1, your task will be to make sure that all of the parameters of the proposed structured training have been examined. You will be documenting all of the directives that you have received from your "client", that is, the training program proponent, whoever is sponsoring or has directed that the development be done. The quality review takes the form

of proponent reviews of the training direction and intent. At this stage, what you need most is approval or concurrence from the proponent that the development is on track with the initial intent. It is crucial that your design and development work not stray from the proponent's vision without his/her approval.

In Phase 2 activities, you will be selecting the training objectives for the program, that is, the tasks that the program will address and train, and the standards for task achievement. The quality review should take the form of an expert review of the selected tasks, which usually involves any offices or agencies who are also "proponent" for the subject matter (e.g., doctrine or training or tactics directorates). These agencies have a vested interest in your product and a responsibility for its accuracy; they are also knowledgeable and can provide valuable information and support.

As you proceed in Phase 3 to develop the exercise outlines and draft pieces for the training support package, the quality reviews will become more active, involving map exercises and simulation-controlled exercises, and finally exercises with nonrepresentative participants. These exercises are intended to evaluate the technical content of the development, with regard to both doctrine and simulation. These are in addition to the constant requirement for proponent and expert review.

Finally, in Phase 4, you will involve representative individuals and units in trying out the program's training support package. These are the formative evaluations that program development always requires. By this time, you are sure that the exercises are doctrinally correct and that they are matched to simulation capabilities, and you are ready to check on how usable they are and whether training occurs. These trials and field tests are extensive and require careful planning, rigorous and intensive information-gathering, and documentation of resulting actions. They are the final point of revision and will demand excruciating attention to detail in order to ensure that all materials are complete and correct.

In the RCVTP development, all of these quality review steps were followed. The formative evaluation tryouts, in fact, were repeated in order to verify the appropriateness of refinements to the program, and three additional periods of observation were undertaken as quasi-formative evaluations to monitor the implementation of the training. The result is a training program that has been rigorously tested and refined among developers, subject matter experts, training personnel, and ARNG units who participated in the training.

In each of the activity discussions which follow, the "Quality Review" step is emphasized by means of a separately headed section to ensure that it receives your attention.

The Methodology for Development of Structured Simulation-Based Training

The detailed guidance regarding the application of the methodology makes up the remainder of this section. The discussion tracks precisely with the outline found in Appendix A, and also refers to the Worksheets found in Appendix B. Each phase of the methodology is introduced by a discussion of the purpose of that phase, along with a list of the activities in the phase.

Each activity is then presented with the five elements described above (Product, Input From, and so on), followed by a lengthy explication of the considerations for that activity and the worksheet fields that you will fill in. Relevant worksheets or portions of worksheets will also be shown.

PHASE 1. INITIAL DECISIONS

Activity 1.1 Document initial decisions.

In the first phase of the methodology, you will make (and/or document) certain decisions about the training that is to be developed. Phase 1 has only one activity--to complete the *Initial Decisions Worksheet*.

Activity 1.1 Document initial decisions.

Product: Completed *Initial Decisions Worksheet*.

Input From: External requirement to develop structured training.

Input To: All other activities.

Revise To: Not applicable.

Quality Review: Proponent review.

The decisions that you will note on the *Initial Decisions Worksheet* (see Figure 2; full copy in Appendix B) will serve as constraints for all of the other activities. The discussion below is keyed to the items on the worksheet.

Date, Unit Type/Echelon. On the worksheet, fill in the date, and indicate the echelon and type of unit for which this training is being developed. If you have several development projects going on at once, create a system of titles or identification codes to help you keep track of the various products that belong with each project. If those projects are related or meant to be linked, fill out separate worksheets for each echelon and unit type, but note the linkage under "Additional Notes."

Mission Type. Decide on and record the type of mission or missions that will be covered in the training. The source of mission designations should be the appropriate ARTEP-MTP. The RCVTP training covered both offensive and defensive missions, and also created a set of fundamental exercises, all addressed to tactical maneuver operations. Your project may include other missions. As you design and develop the exercises in the next phases, you may find that the development splits logically into discrete (if not independent) segments. Such separation into segments may be along mission lines, or may reflect operational phases within missions, or may be based on actual disjointed development efforts (e.g., one mission enacted with different enemy configurations). Thus, for example, you might undertake development of the offensive and defensive missions as two distinct but linked projects. This kind of segmenting serves to keep the development effort manageable, especially for large or complicated projects.

| INITIAL DECISIONS WORKSHEET | |
|--|--------------------------|
| DATE: _____ | UNIT TYPE/ECHELON: _____ |
| Mission type(s): _____ | |
| Enemy type (tactical style, capability): _____ | |
| Terrain (general area): _____ | |
| Technology (and version): _____ | |
| Training target audience (full unit, personnel within unit): _____ | |
| Execution time (target, approximate): _____ | |
| Table structure (one exercise, multiple tables): _____ | |
| Number and nature of entry points (single or multiple entry points; proficiency-based or needs-based): _____ | |
| Additional notes; other decisions already made: _____ | |
| <p><i>Maintain this worksheet as a record of development initiation and decisions.</i></p> | |

Figure 2. Extract from *Initial Decisions Worksheet*.

Enemy Type. You will usually use a fictitious enemy force, but the enemy needs to fight according to some documented tactics. One widely-used source of tactical doctrine is the *Capabilities-Based OPFOR Model* (Department of the Army, 1993), which comprises information for both light and heavy opposing force (OPFOR) in terms of an organization guide, an operations handbook, and a tactics handbook. This specific source focuses on Soviet-style (formerly, Warsaw Pact) tactics; you may want to represent some other type of enemy or doctrine.

Terrain. The terrain that the exercises use will probably be decided by the proponent, rather than being left up to you. Indicate the general area, such as the National Training Center (NTC), or Fort Knox, or Korea. Later, when the time comes to put together the OPOD and sketch out the training events, you can get more specific about where the exercises will occur.

Technology. Make a note of the simulator or simulation that will be used in the training. If there are different versions, document which version will be used. Although you will do a detailed analysis of the technology capabilities in Activity 2.2, you should at this point verify that the selected technology is suitable for the type of training that you are designing. For example, you would not use SIMNET or Janus for gunnery training; you would not use a mobile SIMNET for battalion-level training.

Training Target Audience. Indicate the personnel for whom the training is to be designed. In some cases, this will be the entire unit at the selected level (e.g., armor battalion); in other cases, the simulator or simulation is intended as a trainer for a specific subset of the unit (e.g., battalion staff, fire support).

Execution Time. Every training implementation will have to be conducted within certain constraints; time constraints are the most immediate and apparent. You need to identify those constraints. Sometimes a 4-hour block is reasonable; in other cases, it might be desirable to have 1-hour blocks or 8-hour blocks. You may also be planning for blocks within blocks, such as a series of four 2-hour blocks, or three 4-hour blocks. Whatever it is, the training program needs to be designed to that specification. Note on the worksheet what the specifications/constraints are regarding time and blocks of training.

You are designing to meet a training requirement, not to fill up a specific amount of time. But you will have to design training for reasonable times, broken up into blocks. Be aware that this attention to time is a design constraint, not a training constraint. You need to determine a realistic target for exercise duration, so that the training unit can plan its training time.

Number of Tables. One approach that has advantages for lower level units is to develop sequential but stand-alone tables as partitions of the mission. Units may want to focus on certain tasks, executing only a part of the exercise so they can put all their energy into training on those tasks. If you anticipate that this will be the case, you should try to partition the mission into segments, or tables, at logical break points, and to prepare materials to provide entry and exit at those points. Exercises (and associated materials) that are structured this way give units some options concerning where they can begin and end their training. They also give you the opportunity to structure feedback at frequent intervals--a sound training development principle.

It will not always be feasible to structure exercises as a series of tables. If, for example, you are designing exercises for a staff or staff section, you may find that the flow of events is so continuous that there are no logical break points. It would be easy enough to stop an exercise at some point, although it might be somewhat unrealistic. But to restart it after an AAR, reinstating the conditions that were operable before the break, would be very difficult and would probably cause an unacceptable decrement in training value. Don't expect to be able to partition missions every time. In general, the higher the echelon, the more difficulty you will have in designating partitions.

Number/Nature of Entry Points. Sometimes training is designed as a single continuous exercise, where the only starting point is at the beginning. Other times, the training is intended to allow different starting points depending on the unit's expertise (proficiency-based) or training emphasis (needs-based). Note on the worksheet what decisions have been made regarding multiple entry points. If there are to be multiple entry points, then there will necessarily be more than one block of training and more than one segment or table (covered in Activity 3.3).

Additional Notes. Finally, add to the worksheet any other information concerning the training development that you think may have an impact on the final product. If, for example, you know that you will only be able to use three controllers during execution, or that the simulators will be networked long-haul, or that you will need to accommodate "what-if" exercise enhancements to add training value for especially competent units, or that you will need variations within the exercises to make them suitable for different units--note that type of information on the *Initial Decisions Worksheet*.

If the program is intended to include linked training exercises for several echelons, you should make a note of that under "Additional Notes." This is an important constraint, because you will need to develop all of the linked exercises to be mutually supporting. We would strongly recommend that, if the training exercises are intended to be linked across echelons, and the development projects are *not* simultaneous, you should start the development efforts with the highest echelon. This is usually where there are the greatest demands for resources and simulation terrain, and if the terrain is unsuitable for the higher-order exercises, then the lower-level exercises cannot be linked to them.

Include in this section any training-specific guidance that you have been given. For example, it might be that the purpose of the training is to be comprehensive, including all mission types and all situations for the echelon. Normally, however, your guidance will be more restrictive as to the factors of METT-T or the specific focus of the training, such as emphasis of combat service support. You may even be tasked to design structured training around missions other than war. If you are unsure of these restrictions on the scope of your training focus, check with the proponent early and often during the project. As you begin to define the possible range of training options, the proponent should be made aware of the choices available in order to help focus the training intent.

This activity takes input only from outside the training development process, at least initially. The requirement to develop training for a specified type of unit, mission, and simulation will likely be specified for you by the client, or proponent. As you go on, however, you may need to challenge the decisions. For example, you could discover that the selected technology is not suited for the intended unit size or mission type.

In the development methodology, we say that this first activity and its product serve as input to all other activities. The decisions that you document are central to virtually every activity in the remainder of the development process. They form the basic structure around which the exercises will be developed. For that reason, it is essential that you make sure that the decisions are clearly spelled out before you begin.

Quality Review

At this very early stage, the most informative quality review will be a briefing to the training proponent. By "training proponent," we mean whoever decided that the training was required. This person or agency is your client, and your goal is to get concurrence on the decisions made. This will help to ensure that your design and development efforts are in accordance with the intentions of the proponent.

PHASE 2. DESIGNATE TRAINING OBJECTIVES

Activity 2.1 Identify task sources, tasks, and standards.

Activity 2.2 Refine task list for simulation support.

Activity 2.3 Select tasks that support mission.

During this phase, which is closely aligned with the *Analysis* phase of the SAT, you will determine the tasks that will be the focus of the training program. The three activities will involve finding sources of information and extracting the complete domain list of tasks (Activity 2.1), refining the list to include only those tasks that can (or should) be trained using the selected simulation (Activity 2.2), and then further refining the list to include only those tasks that also support the selected mission type (Activity 2.3). All of the activity products should be documented on the *Task List Worksheet*, or in a format like that shown on the worksheet (see Figure 3; the full worksheet is in Appendix B).

Either of the two refinement activities--Activity 2.2 (that considers simulation capabilities), or Activity 2.3 (by reference to the mission type)--can be done first. It makes

| TASK LIST WORKSHEET | | | |
|---|---|---------------------------------|---|
| DATE: _____ UNIT TYPE/ECHOLON: _____ | | | |
| TASK SOURCES (e.g., ARTEP-MTP, FM; give pub. date): _____ | | | |
| Activity 2.1 | Activity 2.2 | Activity 2.3 | |
| Task number and title | Can task (or part of task) be trained on the selected simulation? (Describe part) | Does task support mission type? | Select task (or part of task) if "Yes" on both questions. |
| | | | |
| | | | |
| | | | |

Attach additional pages as necessary.

Figure 3. Extract from *Task List Worksheet*.

sense to do the one that you expect will result in the most drastic cuts first, so that you can avoid reviewing a large number of tasks in one activity that get set aside in the next activity. The final list, indicated as the product of Activity 2.3, should reflect the results of both activities, no matter which one you do first.

Activity 2.1 Identify task sources, tasks, and standards.

Product: List of tasks and task sources--see *Task List Worksheet*. (Documentation of why other obvious sources will not be used...)

Input From: *Initial Decisions Worksheet* (Activity 1.1), and official sources of task analytic data.

Input To: Activity 2.2--"Refine task list for simulation support."

Revise To: Not applicable.

Quality Review: Proponent review, training and doctrine agency review; after tasks are selected (Activity 2.3--"Select tasks that support mission").

The first activity in Phase 2 involves identifying sources of task analytic information for the unit type and echelon, and then preparing a complete list of all of the collective tasks.

The most obvious sources for task listings to serve as training objectives are the ARTEP-MTPs and FMs. Other sources include training materials prepared by the proponent agencies and task lists developed by the proponent schools. You should at least consider all sources that are known or suggested to you. You may not use them all--they may be redundant or in an early development stage or out of date, for example. You should keep a record of all sources considered and the reason you did not use particular sources that you considered (in case there's a question later).

Make sure that you have the most recent approved versions. If you know that another version is coming out soon, you should review the draft if you can, see what differences there will be, and then get a decision as to whether to use the current or the emerging version. Your decision will depend on when the change or update will be released and how vast the differences are.

For a source to be useful, it must contain tasks for the mission type and for the unit type and echelon. The tasks must clearly describe how to perform, under what conditions, and to what standard. Sometimes, a source will provide statements of conditions and standards, without specifying performance requirements; however, if the performance requirements are listed in another source, information from the two sources can be combined to yield complete task analytic information. Make sure that you check your final list of tasks to eliminate redundancies, and to reduce, as much as possible, cases in which certain tasks are actually subtasks of others.

Depending on the specific document, you may want to focus on what it calls "subtasks" rather than what is labelled as a "task." In some sources, you may even find that

the "subtasks" are the statements of standards. The point is that you need to read the task analytic materials with an open and examining attitude so you can identify:

- *Tasks*--lowest level of collective behavior that has accompanying conditions and standards.
- *Conditions*--description of situation, environment, and initiating cues that should cause a task to be performed.
- *Standards*--statement of correct, acceptable, ideal accomplishment of a task.

Be sure to consider the tasks in light of the selected METT-T. This will describe the performance conditions, and should clarify the performance requirements and standards.

Activity 2.1 takes input from the initial decisions--specifically, the type and echelon of unit and the type of mission--and from the task sources. There is usually one additional constraint associated with this activity: that all the tasks be documented in official sources. The development focus is generally not on testing or creating doctrine. Rather, your objective is to design training that makes use of existing task analytic information that has already been accepted by the organization (e.g., Army, Department of Energy).

The product for Activity 2.1, the list of the tasks found in the source documents and complete reference information on those sources, is then used in Activity 2.2 when the list is refined in order to determine which tasks can be represented on the simulation. Record the information on the *Task List Worksheet* (the first column), or in the format shown on that worksheet. If there are any obvious sources that will not be used, note your decision and your rationale so you have an audit trail for the process.

Your work in preparing the task list is not likely to cause revisions in the earlier activity unless the quality of task analytic information is so poor that structured training for the selected mission and/or unit cannot be developed until the quality of the task analysis is improved. It is also unlikely that you will have to revise this domain list later, unless other sources of task information are discovered or doctrine changes midway through your development.

Quality Review

At this stage, your quality review should be internal--you are reviewing and updating your own work. Once the task list from Activities 2.2 and 2.3 is completed, you should request a proponent review and a review by the appropriate doctrine and training agencies.

Activity 2.2 Refine task list for simulation support.

Product: *Task List Worksheet* annotated to show tasks that can be fully or partially performed and observed in the simulation.

Input From: Domain list of tasks on *Task List Worksheet* (Activity 2.1). Information about the selected simulation.

Input To: Activity 2.3—"Select tasks that support mission."

Revise To: Not applicable.

Quality Review: Proponent review, training and doctrine agency review; after tasks are selected (Activity 2.3—"Select tasks that support mission").

This activity requires you to make judgments about which tasks can be included in the training, based on simulation capabilities. You may find many tasks that you want to train, but that cannot be trained using the selected simulator or simulation. Some tasks can be partially represented, and you will have to judge whether that part is adequately represented to justify its inclusion in the training.

The refining process uses the domain task list, from Activity 2.1, as a starting point. In order to make the judgments of whether or not each task should be included, based on simulation capability, you need a rule-based system that specifies the basis for the decisions. It is *not* sufficient for you to simply look at tasks or subtasks and decide whether or not you feel that they can be represented on the simulator/simulation. The RCVTP development used an approach developed by Burnside (1990) to screen tasks for training on SIMNET and Janus. To use that approach, you will make suitability judgments at the lowest level of task detailing (i.e., subtask standards), aggregate the ratings to higher levels (subtask and task), and then follow a set of rules to determine task trainability.

You may choose to depart slightly from that approach. In the RCVTP development of platoon and company exercises, we aggregated ratings of subtask standards to the subtask level, rather than to the task level. This permitted us to be able to make judgments of trainability at the subtask level and thus be able to cover parts of tasks in the exercises. But whether you use the Burnside methodology or another rule-based approach, you should have at least one other person *independently* make ratings of task suitability. Afterwards you can work together to arrive at a consensus.

As you work through this activity, you will have to be, or have access to, someone who is very familiar with the capabilities of the simulator/simulation. It will not be enough to look at the capabilities descriptions provided by the vendor, nor to take the word of the development engineers and technicians. There is no adequate substitute for first-hand knowledge of the technology; working closely with a technician, who will show you that the simulator/simulation does what you want it to, is a fallback position.

Once you and/or other experts have reached a consensus on what can be supported, record the decisions--supported, not supported, partially supported (and describe the part)--in the second column of the *Task List Worksheet*.

The list of tasks and parts of tasks that are supported will be further refined in Activity 2.3, by examining the list in the context of the mission type. Only the tasks that have survived this first cut need to be evaluated for mission support.

The work on this activity will not cause revisions to earlier activities (i.e., Activities 1.1 and 2.1) unless it turns out that no tasks survive the cut and the technology is totally inappropriate to the unit type or mission. The decisions made in this activity on the basis of simulation capabilities will themselves only change in reaction to upgrades to the technology itself or further information about capabilities (i.e., experience that shows that the capabilities are different than you anticipated).

Quality Review

The quality review is still an internal responsibility, performed by you and other developers on the project.

Activity 2.3 Select tasks that support mission.

Product: Reduced task list--see *Task List Worksheet*. Annotated to show which tasks (or parts of tasks) will be performed and can be observed in the context of the mission, and which tasks cannot be incorporated.

Input From: Reduced task list (after refining for simulation support) on *Task List Worksheet* (Activity 2.2). Any additional guidance on which tasks to train, such as a Mission Essential Task List (METL) (external to the methodology).

Input To: Activity 3.1--"Design training unit's mission."

Revise To: Not applicable.

Quality Review: Proponent review, training and doctrine agency review.

At this point, you are ready to decide which tasks the training should cover or require. How you decide which tasks to select and incorporate may depend on your particular project. In this activity, you will refine the task list by reference to the designated mission type. The product of this activity is the training objectives list, consisting of those tasks and standards that can be fully trained, and those that can be partially trained, and which parts those are. Tasks (or parts of tasks) and standards that are on the list that you prepared in Activity 2.1, and that passed the simulation refinement in Activity 2.2, should now be examined in the context of the mission type.

There may also be other constraints. For example, maybe the training is meant to be a comprehensive program that will include every possible task for the selected unit type and

level and the selected mission type. Maybe you have been told that exercises need to incorporate close air support, or extensive use of indirect fire, or should not incorporate any static defense. Or you may be given a general focus, such as NTC training needs and deficiencies, or the commander's guidance or mission-essential task list (METL) emphasis. You should amend the task list according to any of those "other" constraints or guidelines imposed on you by your client. Record the decisions in the fourth column of the *Task List Worksheet*.

This task list of tasks and standards, which now represents the preliminary selection of training objectives, is used in the activities in Phase 3, where you will construct the tactical scenario that will require units to perform the tasks. As you develop the scenario, you may find that not all of the selected tasks can be required within a single scenario. If you decide in Phase 3 activities (or any other activity) that you will not train a task after all, *make sure* you come back and revise the task list on the *Task List Worksheet* to reflect the change from "Yes" to "No" (that the task will not be covered) and make a note of the reason. This worksheet constitutes an audit trail for you on why specific tasks were selected.

Quality Review

Once the list is finalized (or temporarily finalized), and you have done another internal quality review, document the decisions on the *Task List Worksheet* in the last column, as a permanent record. Then prepare a clean list, and again get proponent concurrence on what will be trained. A briefing to the interested parties will let you describe the procedure you followed, explain and defend your decisions, and get approval to proceed with development. You should also try to involve any interested training and doctrine agencies, so that their early concurrence is obtained.

PHASE 3. DESIGN SCENARIO AND EXERCISE OUTLINE

Activity 3.1 Design training unit's mission.

Activity 3.2 Design higher-order mission.

Activity 3.3 Prepare exercise/table context and specifications.
(Optional--Partition exercise into tables.)

Activity 3.4 Outline events.

During this phase, which mirrors the *Design* phase of the SAT, you will plan and draft an outline of the tactical scenario that will be the context for the exercises, and make decisions about the exercise structure for the training. This is a lengthy phase, comprising four activities. The decisions that you reach and the initial products are documented on or attached to the *Exercise Outline Worksheet* (see Appendix B).

There are several constraints operative in this phase. The first concerns the approach to structured tactical training, which is supposed to closely represent real-world tactical situations. That realism requires you to develop the mission scenario for the training unit level and for two echelons up (e.g., platoon-level exercises require supporting mission outlines for company and battalion levels). Mission scenarios will generally be presented in the form of operations plans (OPLANs) and OPORDs. The OPORD should be completely plausible within the context of an overall OPLAN (whether or not you actually develop the OPLAN), which should itself be doctrinally acceptable.

Similarly, the enemy should be realistic. You specified the enemy type in Phase 1, and you need to follow through on that decision in prescribing the enemy capabilities and tactics in the exercises. That is, the enemy needs to be configured and to behave in the exercises according to some model or intelligence. Make sure that the enemy to be presented is doctrinally appropriate for the size, composition, and mission of the unit being trained.

In order to maintain the realism of the exercise throughout its execution, you should develop the entire scenario for a designated piece of terrain, and make the exercise move across that terrain in a real-time, real-space fashion. In this approach, the entire battle or series of battle events will occur in the exercises as a continuous flow on a (large) selected piece of ground. The alternative is to enact different pieces of the exercise in separated locations. This can be accomplished using the simulation capabilities to transport the unit on the terrain and "fast forward" the scenario to some future time; but this in turn probably requires separate OPORDs, narratives explaining how the unit got where they are, disconnects in the flow of the battle, and other awkward side-effects. It is not recommended; however, for missions or operations that require long periods of time or extensive terrain, it may be the only viable solution.

The other two constraints concern how the exercises will be structured. Whether or not you are going to partition, the exercise should move in a continuously forward fashion (that is, the exercise never jumps back in time to earlier events in a battle or engagement). It

may be viewed as a single battle or engagement or mission, executed from start to finish. But even though it is one continuous mission, if you are going to structure partitions, you will be looking for places to pause in the battle and bring the unit out for an AAR. You will also be designing the re-entry points in such a way that they can serve as initial entry points for units that want to focus on selected tasks.

The final constraint concerns task sequencing. Even though the unit will be performing tasks in whatever sequence the mission requires, you have some flexibility in designing the mission scenario so that tasks will occur in an order that you control. The most likely sequences that make sense from a training/learning standpoint are crawl-walk-run, natural order, hierarchical order, and easy-to-difficult. The intent of each of these is as follows:

- *Crawl-walk-run*--Tasks are repeated several times (technically, three times) under increasingly demanding conditions, in order to hone the unit's performance skills. Conditions are usually made more demanding by changing the mission, increasing the enemy strength or capability, or requiring the unit to perform in more challenging terrain (three of the five METT-T elements). This sequencing provides opportunities to reinforce training and to work toward automation in performance (i.e., making performance more automatic, as is the goal with contact and battle drills).
- *Hierarchical order*--Tasks are examined to determine whether any of those selected actually contribute to, or are subtasks of, other tasks. As examples, being able to execute a line formation is required in order to execute an action drill; consolidate and reorganize are two collective tasks that are generally subtasks to all missions. In general, the mission scenario itself can be designed to permit early focus on lower level tasks in the hierarchy, and later emphasis on the higher level tasks. In order to make this happen, however, you need to determine what the hierarchical relationships are.
- *Natural order*--The sequencing of tasks in terms of the normal order in which they are performed will generally happen without explicit effort because of the tactical context in which the exercises are embedded. Just as the events follow a natural chronological order, because they occur within the framework of the start-to-finish mission, the tasks for a given unit will be required in a chronological order. This does not imply that this is the best order for learning tasks, but it does provide a structure for performance cuing that reflects real world requirements.
- *Easy-to-difficult*--Tasks are rank-ordered according to difficulty, and the exercise or tables are designed so that easy tasks are required first, and more difficult tasks are gradually introduced. The advantage provided is that units have time to adjust to the training environment before they are required to perform the more difficult tasks. The disadvantage is that you need to obtain ratings of task difficulty somewhere, either from subject matter experts or from other research. There is

little evidence to suggest that learning occurs better using this sequencing, unless it is incidentally supporting one of the other three sequencing schemes above.

It is unlikely that you will have a stated directive for sequencing. All of the sequencing principles described above are appealing, and even seem to be redundant in some cases. You may decide to try to work with just one approach, or to try to use whichever seems appropriate for particular tasks and parts of the training. What you should *not* do is systematically or deliberately violate any of them, that is, go from demanding conditions to easy conditions (run-walk-crawl), or consistently from difficult tasks to easy tasks, or in a backwards or random progression.

This process of structuring the scenario also serves to clarify the task standards, from the general levels usually found in ARTEP-MTPs to very specific METT-T-driven standards. For each of these structuring considerations--incorporating realism two levels up, using documented enemy tactics, using selected terrain, partitioning exercises, and sequencing--you should consult with the proponent and arrive at the corresponding decisions before continuing with this phase of development.

The *Exercise Outline Worksheet*, found in Appendix B, requires details of all of the decisions that you will make during this phase of the methodology process. Note that there is nothing magic about this outline format. It includes reference to all of the information required prior to developing the exercise events guides and other materials, but the format is only a suggestion.

On the worksheet (see Figure 4), enter first a brief recap of the prior decisions: the unit type and echelon, the mission type and enemy type, and the selected technology. This serves to identify the development project. You can list the tasks and sources, or add a current copy of the *Task List Worksheet* (Phase 2). Then fill out the rest of the worksheet as you proceed through the four activities in this phase, adding copies of documents as appropriate and using the worksheet as a guide to what is required.

| EXERCISE OUTLINE WORKSHEET | |
|---|--|
| 1. Identifier | |
| a. Unit (type, echelon) | |
| b. Mission type | |
| c. Enemy type | |
| d. Technology/simulation | |
| 2. Training objectives (list or attach <i>Task List Worksheet</i>) | |
| a. Tasks | |
| b. Sources/References | |

Figure 4. *Exercise Outline Worksheet*, parts 1 and 2.

Activity 3.1 Design training unit's mission.

Product: Draft of training unit's "concept of the operation" with sketch of graphic overlay and/or draft of unit OPORD. Applicable portions (parts 1, 2, and 3) of *Exercise Outline Worksheet*.

Input From: *Initial Decisions Worksheet*. *Task List Worksheet*, column 4 (selected tasks).

Input To: Activity 3.2--"Design higher-order mission." Activity 3.3--"Prepare context and specifications."

Revise To: Activity 2.3--"Select tasks for training," if tasks *cannot* all be accommodated in the mission(s).

Quality Review: Map exercises.

If you have gone through the methodology in the order presented, you now have the selected task list, showing which tasks can and should be trained in the context of the mission scenario that will be designed. You also know about any other constraints on the design, such as the amount of time available, the need for stand-alone tables, sequencing preferences, the nature of the enemy, and the general area (terrain) where the exercise will be conducted. You may even have already started to think about how to form the tasks, unit, enemy, and terrain into an exercise or series of tables.

The requirement in Activity 3.1 is to prepare a rough draft of the training unit's mission. (The section of the *Exercise Outline Worksheet* specific to this activity and the next one is shown in Figure 5.) This product could look like a concept of the operation, or a course of action, or a sketch of a map with notes to indicate what will happen where. For some exercises, the actual ground where the battle is fought is important, but the selected tasks are not performed on that ground. For example, in battalion staff training, the staff generally stays at command post locations throughout the battle, rather than being out on the battlefield. As a result, you may also need to prepare an event-by-person/section matrix to indicate what events should happen, and what the enemy and all controlled units will be doing.

EXERCISE OUTLINE WORKSHEET (Continued)

-
3. Scenario Context (*Activities 3.1 and 3.2*)
 - a. Mission (brief descriptions)
 - i. Training unit's mission
 - ii. One level up
 - iii. Two levels up
 - b. Task organization

Figure 5. *Exercise Outline Worksheet*, part 3.

Your product needs to indicate a plan for the initial locations, major events, and players (friendly and enemy), and map coordinates for the area of terrain covered. As you do this, keep in mind that you will also be developing the supporting mission for one and two organizational levels (or echelons) up (in Activity 3.2), and that the product for the training unit needs to be plausible in the context of the product for the higher-order unit. On your plan, make some notation of where the selected tasks (from Phase 2) are expected to be performed in the course of the execution.

Add a description of the unit's mission to the *Exercise Outline Worksheet* at part 3a(i), Scenario Context. Write it on the worksheet or attach a separate document--either way, as long as it's decided and documented.

In addition to its use as the basis for Activity 3.2, this draft plan is also going to serve as input to Activity 3.3, where you will partition the mission (if that was one of your initial decisions) and examine the task performance sequence in the tables to see if it matches (or at least doesn't violate) your sequencing plan.

This activity and the next two--that is, Activities 3.1, 3.2, and 3.3--are closely tied and interdependent. You will usually be going back and forth frequently between the training unit's mission and the higher levels' missions, and between the missions and the detailed scenario outline in Activity 3.3, in order to make sure that they are tactically correct and fully coordinated.

The work on this activity (in conjunction with the next two activities) might result in changes in products of earlier activities. For instance, you may find that this product does not trigger performance of all of the selected tasks and that you are unable adjust it so all tasks can occur in a tactically realistic scenario. In that case, you need to go back to Activity 2.3 and correct the selected task list so that it is accurate with respect to tasks that are trained.

Quality Review

In order to check on whether the product supports all of the selected tasks, and to verify that the mission is tactically adequate, you should conduct a map exercise³ of the mission. This will help to ensure that the terrain selected is appropriate and that the operation concept is rational and intuitively acceptable. Use content experts in this process, so that you get other views of whether the mission makes sense.

³ In a map exercise, the training audience roles are portrayed by content experts, who play out the mission by moving pieces that represent their vehicles on a map. OPFOR units are also moved, in accordance with the tactics of the selected enemy type.

Activity 3.2 Design higher-order mission.

Product: Draft concept of the operation or draft OPORD with graphic overlay sketch, for one and two levels above training unit. Applicable portion (part 3) of *Exercise Outline Worksheet*.

Input From: *Initial Decisions Worksheet*. *Exercise Outline Worksheet*, part 3a(i) (Activity 3.1).

Input To: Activity 3.4--"Outline events." Phase 4--"Develop training support package."

Revise To: Activity 3.1--"Design training unit's mission," if higher mission cannot be designed to provide context for planned training for the unit.

Quality Review: Map exercise.

In this activity, you will be drafting the higher level unit mission corresponding to the mission plan designed in Activity 3.1. This is essentially the same process that you followed in Activity 3.1, but for a higher echelon. For both one level up and two levels up, you need to develop a draft of the overall operation. The purposes for doing so are, first, so that you are assured that the training unit's mission has some tactical realism and logic to it; and second, because in most cases the next higher level unit's OPORD will be provided to the unit to assist them in preparing for the training.

Thus, in the RCVTP, for battalion and battalion staff exercises, units received both the battalion and the brigade order in advance of their training time; companies got both a battalion order and a company-level narrative concerning the mission; platoons got the company-level narrative and a platoon-specific set of orders.

The product of this activity will usually be more complex than the product of Activity 3.1, partly because higher level units have more complex command, control, and synchronization requirements, and also because of the requirement to represent combat support and combat service support elements. At each of the two levels, it may consist of any or all of the following: the description of the mission and intent; a situational template that shows your plan for the enemy's activities (location, objective, mission, intent, and course of action); a plan for the terrain that will support the mission (area of operation); and a rough sketch of the graphic overlay of control measures for the mission.

Again, post the information to the *Exercise Outline Worksheet* (part 3, Scenario Context) or add documents that contain the information. Use the worksheet topics as a checklist or guide to the requirements.

The input to this activity is primarily the draft mission prepared for the training unit level in Activity 3.1, which you now have to support with this product. You are also constrained by the requirement that the enemy behave according to enemy doctrine, and that you use contiguous terrain. Although you may use the "fast forward" technique described earlier to skip over portions of the execution, the underlying execution has to be possible on the selected terrain, in a realistic flow.

The product will be used when you prepare the initial outline of the exercise in Activity 3.4, and also as the basis for some of the materials to be developed in Phase 4. Later activities should not directly cause changes to this product. However, if anything causes the unit's mission to change (Activity 3.1), you should examine this product to see if any corresponding corrections are required.

As you work through this activity, if you find that you can't fabricate a mission that will provide context for the training unit's mission, then you may need to go back and forth between these two activities--3.1 and 3.2--to work out something that is tactically sound and that still provides the required training. In fact, you should already be going back and forth frequently, in order to develop a complete and coordinated set of orders.

Quality Review

The quality review activity here is another map exercise. Try to involve the same people who helped in Activity 3.1, so that the details of the training unit's mission are also considered. As with any map exercise, you will be examining the reasoning behind the tactical plan. Specifically, you will be examining every decision made concerning the unit's mission, the higher-order mission, and the intended enemy behavior.

Activity 3.3 Prepare exercise/table context and specifications. (Option--Partition exercise into tables.)

Product: Context, specifications, and execution details for exercises/tables. Applicable portions (parts 4a, 4b, and 4c) of *Exercise Outline Worksheet*.

Input From: *Initial Decisions Worksheet*. *Task List Worksheet*. *Exercise Outline Worksheet*, part 3 (Activities 3.1 and 3.2).

Input To: Activity 3.4--"Outline events."

Revise To: Activity 3.1--"Develop training unit's mission," if mission does not allow for selected task sequencing, or if partitioning results in tables that are too long, or short, or boring.

Quality Review: Simulation-controlled exercise.

Note: If the exercise is not going to be partitioned, check the full exercise for task sequencing and prepare exercise context descriptions, unit specifications, and execution notes (see *Exercise Outline Worksheet*).

This activity is always required, whether or not you are partitioning the exercises into the smaller chunks we called "tables." Parts of this activity will be performed only if exercise *tables* will serve as exercise entry points. Regardless of whether you are using tables, you should always verify that the sequencing of tasks matches your intent. This activity is also where you prepare the context statements, initial unit specifications, and execution descriptions, either for tables or for full exercises.

If you are going to partition the mission into separate tables within the exercise, you should consider two things: logical stopping points within the exercise (e.g., initial enemy reconnaissance elements, trigger points, phase lines, or mission transition points such as a battle handover to defeat enemy attack), and the desired length of each table. Look for breakpoints that are plus or minus 15 minutes of what you really want; estimates at this point are usually not very accurate, so be flexible. If it turns out that some of the tables are too long or short, you may shift the breakpoints or add/delete events to/from the tables (usually by means of adjusting enemy strength or by providing a change of mission or fragmentary order (FRAGO)).

Using the task list (from Phase 2) and the mission (from Activity 3.1) as input, draft a narrative or graphic description of the tables, including their starting and approximate ending locations, the events that will occur, and the tasks that will be performed by the unit in that table. Once you have the tables laid out, check to be sure that they are of the appropriate length (estimated) and that they reflect the sort of sequencing that you want. The time length that you're aiming for was decided earlier, in Activity 1.1 ("Initial Decisions").

The product here includes the narrative and/or graphic representation of the tables, as well as documentation of the information on the *Exercise Outline Worksheet* (Partitions/Tables, parts 4a, 4b, and 4c) (see Figure 6). If you have partitions or tables, you need to repeat part 4 for each one; if not, do it for the overall exercise as a single entity.

| EXERCISE OUTLINE WORKSHEET | |
|----------------------------|--|
| 4. | Narrative and graphic representation of partitions/tables (If exercise is not to be partitioned, do this for the full exercise.) |
| a. | Context |
| i. | Friendly situation |
| ii. | Enemy situation |
| iii. | Preceding events |
| b. | Specifications |
| i. | Training unit--identification, starting location |
| ii. | Higher level--identification, location, how represented |
| iii. | Subordinate--identification, location, how represented |
| iv. | Adjacent--identification, location, how represented |
| v. | Manned systems' status--system number and type, identification, location/azimuth/formation, maintenance/fuel/ammo status, etc... |
| vi. | Other systems' status--unit type, system number and type, friendly/enemy, location/azimuth/formation, capability, etc... [Includes semi-automated forces, interactor-controlled systems, etc...] |
| c. | Execution |
| i. | Ending point--location and event |
| ii. | Table Intent (unit reaction) |
| iii. | Tasks covered in table (crosswalk) |

Figure 6. *Exercise Outline Worksheet*, part 4.

In part 4a, describe the friendly situation for not just the unit but also for the next higher level unit; include specifications for adjacent and subordinate units (if applicable) as well. The enemy situation should include the enemy capabilities, organization, scheme of maneuver, and the enemy's plan or intent. Under preceding events, give a short description of the immediately preceding events that brought the forces to this point. If the exercise is partitioned into tables, this will be a description of what should have happened in the one or two immediately previous tables; if you aren't creating tables, it will be what happened immediately before the exercise started. Each of these should be just a short paragraph; don't compose the "road to war." Specify the starting points for all of the represented units in terms of approximate location (4-digit grid or control measure).

In part 4b, you are to decide on and document certain specifications for all of the represented units and vehicles. Here you should identify, by name, every friendly or enemy unit that needs to be represented in the simulation--give each of those units a unit identifier, tell how they're organized, and tell how they'll be represented (e.g., voice, semi-automated, notional). For any systems or unit elements that are live (i.e., operated by humans), give complete initial specification for the simulation (system number and type, call letters, location/azimuth/formation, maintenance/fuel/ammo status). Also develop the specifications for each automated or semi-automated systems (unit type, system number and type, friendly/enemy, location/azimuth/formation, capability). Even if you are an expert on the simulation technology, you need to have another expert look over your products to make sure that you have specified values for all parameters or used the appropriate defaults.

Part 4c(i) asks you to detail, for each table, the ending point in terms of the approximate location and the event or condition that signals the end of the table. In most cases, because the exercises are in scenarios, achievement of a task standard will not be the indication to end a table. The scenario (i.e., segment of the mission) will usually continue to a logical ending.

You should also document the table or exercise intent, that is, what the unit is supposed to learn or accomplish during the table (part 4c(ii)). Be specific here--this is not supposed to be just a short table title or task list, but it's not enough to just list the tasks again. The table/exercise intent will usually give a brief description of the conditions (heavy artillery, light enemy contact, severe time constraints) as well as a statement of what the unit does in terms of what you want them to learn. Finally, in this part of the worksheet, make a crosswalk matrix (tasks down the side, tables across the top) showing which of the selected tasks (Phase 2) are the focus of each of the tables (part 4c(iii)).

If you are *not* partitioning into tables, you should check the sequencing of tasks for the overall exercise, and complete parts 4a, 4b, and 4c on the worksheet for the overall exercise. The crosswalk matrix in part 4c(iii) will not be needed, but do check that all selected tasks are still required somewhere in the course of the exercise.

Whether or not you are partitioning, the information on the worksheet and the mission narratives are used in the next activity (Activity 3.4). There, you will begin to delineate the events that have to occur during the course of the exercise.

You may find that you cannot discern any logical breakpoints in the flow of the exercise. In that case, you may want to adjust the training unit's mission in order to impose some breaks. That means returning to Activity 3.1 to redistribute or expand the scenario in order to spread things out some and allow the needed lulls in the action to occur.

Tryouts with representative units (Phase 4) will be the best opportunity for verifying that the partitions are not too long or too short, too easy or too hard. You may discover that the enemy is too strong, that an initial location is tactically inappropriate, that tasks cannot occur where you thought they could, that the starting or ending points are not viable, or that the table intent changes as you learn more about how units perform on the exercise. Even before those tryouts (Phase 4), however, you will get some idea of the feasibility of the partitioning through the quality review process described next. If you find that you need to rearrange the partitions or change specifications or context, then you need to post the changes to the unit mission description material. This, in turn, will cause you to review the higher level mission to insure that all missions and orders continue to track.

Quality Review

You should conduct another quality check on the feasibility of the details and specifications that you selected in Activity 3.3. This time, you should go to the simulation for the exercise pilot test. Use whatever automated or semi-automated features are available; the goal is to standardize the exercise tryout by relying on human players as little as possible (so as to reduce human error and variability). The purpose of the tryout is to verify that everything can be represented on the technology, that it all fits on the terrain, that the exercise and exercise partitions are of the right length, that the friendly and enemy capabilities are set appropriately, and that it all makes good tactical sense.

Activity 3.4 Outline events.

Product: Event list showing cues, expected performance, and critical tasks or subtasks.

Applicable portions (parts 5 and 6) of *Exercise Outline Worksheet*. (If exercise is not going to be partitioned into tables, prepare the Outline, part 5, once for the overall exercise.)

Input From: *Initial Decisions Worksheet*. *Task List Worksheet*. *Exercise Outline Worksheet*, parts 1-4.

Input To: Phase 4--"Develop training support package."

Revise To: Activity 3.3--"Prepare context and specifications," if exercise or tables don't have enough scope for events that cue designated critical subtasks.

Quality Review: Tryout with knowledgeable personnel.

This activity will lead you through the requirements for specifying all of what goes on during an exercise. The events within the table are carefully controlled so that they will occur when required in order to provide the conditions for training. "Events" are defined in

terms of the cues or trigger points that cause the unit, enemy, or other unit to take action, and the unit's expected response. Note that it is entirely possible for the unit's reaction to trigger the next event by causing the enemy or higher level to do something, which in turn causes the unit to do something else. For each event in which the unit acts, the specific training objectives (critical subtasks and standards) should be designated.

The input for the activity is the *Exercise Outline Worksheet*, which includes the draft mission descriptions (Activities 3.1 and 3.2) as attachments, as well as specific information about the conditions for each table (Activity 3.3), such as starting and ending points of each table and the initial configurations of the unit and enemy. The purpose of this activity is to add content to that initial outline.

For each partition, you should decide:

- what will start the event (e.g., an order to move out, a flight of helicopters, unit reaches a particular control point);
- what the unit's response should be (e.g., move out in column, active air defense, report); and
- what critical subtask you want to observe, and to what standard.

Note that the unit's reaction to the starting cue could call for a response from the "commander" (role-played by an interactor), which in turn might be the cue for the next event. It might also be the cue for some enemy action (e.g., when unit crosses the line of departure (LD), send enemy patrol on the route from NK215885).

Part 5 of the *Exercise Outline Worksheet* (see Figure 7) contains a suggested format for listing events using a four column table. In the first column, identify the event with either a number or a short label (e.g., "Cross LD" or "Contact with enemy patrol"). Indicate the stimulus or trigger or cue for each event in the second column. In the third column, specify what the unit's response should be. And in the fourth column, write down the critical subtasks that the observer should be watching for. These will usually be specific subtasks of the tasks that you planned to train by means of the event, and that you listed in part 4c of the worksheet. Your objective is to list precisely what performance should be observed. Also indicate here the performance standard that will be the yardstick for assessing performance.

The longer the exercise (especially if you don't have tables), the more likely it is to become free-play, and the harder it becomes to make a definitive events guide. But the intent of *structured training* is to provide the conditions for the unit to learn specific things in a rational (not random) order. Repeated practice under standardized conditions limits performance randomness and makes it possible to identify changes in performance and lingering performance deficiencies. These judgments of improvement or deficiency are, of course, made by reference to the task standards. It is important, then, to work at making things happen your way, rather than throwing the unit in and letting things happen as they will. The Phase 4 tryouts will be useful to you in capturing the likely unit actions and verifying that you have anticipated and represented the most probable flow of the mission.

EXERCISE OUTLINE WORKSHEET (Continued)

5. Events [by table].

| Event number or description | Stimulus or Cue (causes unit to do something: Controller, interactor, or other actions; trigger point; etc...) | Unit Response (what the unit is expected to do) | Tasks/Critical Subtasks (observation points) |
|--|---|--|--|
| | | | |
| | | | |
| | | | |

6. Additional notes

*Attach draft Concept of the Operation for training unit and higher level unit and draft overlay.
Assign ID codes to tables.*

Figure 7. *Exercise Outline Worksheet, parts 5 and 6.*

When you select the critical tasks or subtasks for an event, be conservative--try not to recommend observation of more than about four or five for any one event; experience in the RCVTP suggests that this is the limit for careful observation. These are the tasks or behaviors that you are directing the exercise observer to evaluate and discuss in the AAR. Be selective, and pay attention to the sequencing. For example, after you have called for observation of a platoon executing a line formation in two events, you might watch for something else, something more difficult, in the next contact drill. It is not only permitted, but even recommended that you call for observation of a task or subtask in more than one event. If you require it in several successive events, the observer can watch for consistency in performance, spot trends, allow the unit to learn from experience, or directly coach the unit on how to improve. Avoid the use of "global tasks"--tasks that are performed and that the observer is to watch for at all times rather than at specific times. The most likely result is that they will not be observed at all.

When you have completed this activity, you will have a draft of all of the design documents for the exercise and tables. This is the information that forms the basis for the development of the exercise package components in Phase 4. Now review it carefully. Make sure that all of the pieces--mission narratives, overlays, outline worksheet with context and specifications, and event table--are in full agreement. One way to do this is by involving several interested colleagues who are knowledgeable about the unit and mission, and have them walk through the entire operation while you observe and take notes.

If you discover, as you develop the exercise components, that you can increase the training utility by changing the events--you need more, or fewer, or in some different order--you should revise your outline accordingly. It is a document for the record, and to the extent that you can keep everything current and in agreement, you will have a better chance of making all of the products in Phase 4 agree.

If you ever have to revise these events, make sure that you go back and check the other elements of the *Exercise Outline Worksheet* to verify the correctness of all of the pieces. Everything is interrelated now--a change at any point can cause other changes to cascade madly through the entire design.

Quality Review

The quality review for this activity is a dry run of the exercise with live players. This is probably the first time that you will bring together the exercise specifications, the simulation components, and live participants. Your players should be individuals who are knowledgeable about the subject matter (the mission, unit type, operations, etc.) and who are attuned to instructional design considerations. They must have the expertise needed to participate in the training as well as the awareness of the indicators of training quality that you're looking for. If you have been using the intended O/C/Is as subject matter experts already, you can ask them to participate as O/C/Is. But if they haven't been involved yet, don't bring them in for the first time right now. During this dry run, you want to standardize everything except the live participants and their execution attempt.

Your main objectives in the observations in this tryout are to determine:

- whether the scenario and order are tactically appropriate for the terrain and events,
- whether the exercise specifications for other units, friendly and enemy, are correct,
- whether the locations permit the exercise to unfold as you intended,
- whether the event cues cause the right (i.e., intended) things to happen,
- whether the critical performances are observable and measurable, and
- whether the performance standards are clearly stated and achievable.

Although you should be able to test some of this before the tryout, an actual dry run is another check on how the pieces fit. You should only be observing, taking notes, and debriefing all of the participants (players and controllers), rather than being a participant yourself. If considerable changes are made as a result of this tryout, you should repeat the tryout using the revised exercise.

PHASE 4. DEVELOP TRAINING SUPPORT PACKAGE

Activity 4.1 Prepare training support package components for the O/C/I.

Activity 4.2 Prepare training support package components for the unit.

This is the final phase in the development methodology, wherein you will actually develop all of the components associated with the structured training program. This is the stage where there is the widest range of possibilities for various unit types and levels and for different simulations. All of the products, that is, the exercise package components, are developed specifically for the selected unit, mission, and technology.

The most important external considerations that can affect your efforts for this phase are the typical instructional design considerations: to make the materials not only technically correct and complete, but also user-friendly. In order to do this, you need to know who the users are and what they will use the materials to do.

In general, there are two kinds of users. One kind is the trainers themselves, the O/C/Is who facilitate the training. Although the three roles are different, you will often have one individual filling more than one; for simplicity's sake, we refer to them globally as O/C/Is. O/C/Is will include anyone involved in working with the unit in preparing for the training, delivering the training, operating the simulation controls, and providing feedback. Usually there will be more than one O/C/I, each with a different function, especially during execution of the exercises.

The three roles have responsibilities as follows:

- *Observers*--those who critically monitor the unit's performance, assess performance against known standards, and provide feedback in the form of AARs and summary reports.
- *Controllers*--those who operate the simulation and its associated components (e.g., simulation-user interface, operator console, recording mechanisms, communications equipment, report generation devices) during conduct of the exercise and during playback.
- *Interactors*--those who play the role of notional adjacent or higher headquarter unit commanders, enemy forces, and other supporting elements that are to be represented by live players, or that will be only partially simulated.

How those roles and responsibilities are implemented will depend, in part, on who the O/C/Is are. If, for example, the O/C/Is are members of the training unit, the Advance Visit and associated materials (described below) are likely to be something that they use to prepare themselves and their own unit for training, rather than something that is delivered to another unit's training officer. If, however, they are a training cadre assigned to the simulation site, who train many different units (as was the case for the RCVTP), then the Advance Visit is a

more formal handoff to the unit leadership of materials and responsibility for preparation. The content and format will be different in these two situations.

The other group of users is the members of the unit being trained. Unit personnel include not only those who will participate in the training, but also the leadership above the unit being trained. Those leaders may be making decisions about participation, and will require reports on the outcome of the training.

If you are trained as an instructional developer, then you understand the principles of materials development that can make the program accessible; if not, the discussion below will highlight the most important things that you can do to make sure that the user can, in fact, use the materials.

There are two activities in Phase 4. Both are organized around the targeted users (the O/C/I and the unit) of different items in the training support package (as opposed to being two separate and sequential processes or operations). For both activities, the quality reviews are becoming more formal. Expert reviews of the simulation-connected parts, the training content, and the instructional design will insure face validity. Tryouts that involve the real O/C/Is, as well as representative units acting as participants, will provide evidence of the useability of the materials. Data collection will be standardized and intensive, involving individual and group interviews and detailed observations of a wide variety of indicators.

Activity 4.1 Prepare training support package components for the O/C/I.

Product: Materials to support the O/C/I in the advance preparation with the unit, orientation to and execution of the exercise, delivery of the AAR, preparation of the summary report, and programming or configuring the simulation for the scenario.

Input From: *Exercise Outline Worksheet* and attachments.

Input To: Not applicable.

Revise To: Any of the preceding activities, if gaps or discrepancies are detected.

Quality Review: Expert reviews, tryouts with O/C/Is and representative units (formative evaluation) in conjunction with Activity 4.2.

This set of materials will include everything that the O/C/Is need to use or refer to in implementing the training program. These three roles--observer, controller, and interactor--are distinct, although more than one role may be played by an individual.

In your particular project using the methodology, you may be using people in all three roles, and those roles could be mixed in any possible combination. In the discussion that follows, we will continue to use the term "O/C/I" to indicate all of the trainers who will be filling any or all of those roles. As you develop materials for them, you need to decide how those roles will be combined (if at all) so that you know which materials, aimed at one role, should be combined with materials for another role.

Most of the applications of the methodology will involve at least six groups of products for the O/C/I:

- Advance materials,
- Materials used during orientation and execution,
- Materials used in delivering the AAR,
- Materials used for the summary report to the unit,
- Materials used to program or configure the simulation for the scenario, and
- Training management materials.

Each of these kinds of materials is described briefly below.

Advance materials. The primary purposes of the advance materials include providing information for the unit to use to help them select which part of the program to start with (e.g., if there are tables or more than one mission type or echelon), planning their personnel distribution, and giving them guidance for preparing for their participation. The materials that the O/C/I gives or sends to the unit for their use are discussed under Activity 4.2. Here, you need to develop the materials to help the O/C/I explain the materials to the unit leadership, go through the procedures for exercise or table selection, and help the unit leaders set up a plan for preparation and a schedule for the training period.

What the advance materials for the O/C/I will look like depends, of course, on what the advance materials for the unit look like (see Activity 4.2) and who the O/C/I is, as well as on the training program itself. Typically, the O/C/I materials include a description of the items in the Advance Information Package for the unit; the O/C/I uses those descriptions to explain the pieces to the unit. For the O/C/Is to help in exercise or table selection, they need a guide that shows the tasks trained in each table, the table intent, what level of personnel staffing is required to conduct the mission, how long each table or exercise takes, and roughly how difficult the table is in terms of METT-T. All of this information should come readily from the design products already prepared. It would be a good idea to provide the O/C/I with a checklist of what to take or send to the unit, as well as a recording form that shows what information needs to be obtained from the unit and what decisions need to be made.

If the O/C/I is a member of the unit, he/she will probably be required to extract the appropriate pieces of the training support package for use in exercise selection and pre-training preparation. You should provide complete instructions to guide the appropriate extraction.

Materials used during orientation and execution. During the orientation, the O/C/I tells the unit what they are expected to do and gives the unit the setting or context for the exercise, usually immediately before the exercise begins. For most exercises, it will include a description of the situation at the start of the table or exercise, a listing of the critical subtasks

that the table or exercise will focus on, information concerning the unit's location and status at the beginning of the table or exercise, and a repeat of the mission order or commander's intent. It may also include an administrative guide for functioning in and around the simulators. It should include an introduction to the training program (to be delivered one time, at the beginning of the unit's training) as well as instructions specific to individual tables or exercises. For some types of simulation (e.g., SIMNET), you can include instructions to the O/C/I on how to provide a fly-over of the terrain on which the unit will be moving, pointing out control measure locations and even identifying key pieces of the terrain.

The O/C/I will also need specific guidance on how to initiate an exercise. If he/she needs to call up files, input initial settings, build control measures within the simulation, or even just flip a switch, provide that information in the O/C/I's instructions.

During execution, the O/C/I will need an events guide, showing what needs to be done or said as a cue (stimulus) to the unit, what the unit should do in response, and what critical subtasks and standards are being addressed by that action. The O/C/I also needs a place to write notes concerning performance on the teaching points, which will be used in delivering the AAR. Make this as useable as you can--pay attention to the formatting so that the O/C/I is not referring to several different documents while controlling the exercise, use font changes to highlight things to be read and things to be done on the simulation, and construct a page layout that doesn't waste the O/C/I's time. (If you find that you can't simplify it to where it's useable, you're probably requiring too much of the individual O/C/I and should revisit the proposed staffing.)

If you can automate the information gathering process in such a way that the O/C/I's job is simplified, so much the better. For example, the next-generation RCVTP training support package is to include laptop computer-delivered events guides with a facility for keystroke or button entry of observations by the O/C/I, and a routine for summarizing those observations for the AAR and summary feedback report.

Either provide or give the references for any doctrinal materials that give the standards for the critical teaching points. If the simulation is such that some of the standards cannot apply (*i.e.*, the unit cannot do the tasks called for, or they cannot be observed) then you need to make clear to the O/C/I that only certain parts of the task will be observable (and specify those parts).

If more than one O/C/I is required to run the exercise for a given unit, you need to construct separate sets of materials for each of them, each set containing just what that O/C/I uses. Maybe one O/C/I is operating the controls for the simulation to play the enemy--that O/C/I needs a different set of materials than does the O/C/I who observes the battalion commander making decisions.

Finally, give the O/C/Is a roadmap through the materials, so that they can construct a set of materials specifically for their own function or role. Remember, much of the material will be used for taking notes during exercises, so the O/C/I will have to make copies for every unit coming to the training. You need to let him/her know which pieces are needed for different exercises or tables.

Materials used in delivering the AAR. The approach to the conduct of AARs is modelled on the Army's format for AARs, found in FM 25-100, *Training the Force* (Department of the Army, 1988g). It follows a five-paragraph approach:

- Training objectives--what were the training objectives for this exercise?
- Commander's intent--what was the unit's plan for carrying out the commander's intent?
- Enemy intent--what was the enemy trying to accomplish in this part of the mission?
- Battle summary--briefly, what did the battle look like?
- Discussion of training objectives--how did the unit do? Did they meet or exceed standards? Did performance improve on some points over the course of the exercise? What are they doing well on, and where do they need more work?

You should provide the O/C/I with the list of training objectives (critical subtasks and standards) selected for the exercise, and also with a statement of the enemy intent. During the AAR, one of the unit members is usually required to state the unit's plan for the exercise, but you should give O/C/I a standardized plan for comparison. Likewise with the battle summary: You should give the O/C/I a summary of what should have happened, with the warning that the summary may need adjustment based on what actually did happen. Particularly for long exercises and higher echelon exercises, this will vary because of the considerable free play that necessarily occurs.

Usually, the discussion of the critical subtasks is organized around events. If the simulation has a playback capability, the O/C/I can point out where the performance was observable and what the outcome of performance or nonperformance was. The event guide (if built as suggested above) will indicate where the selected critical subtasks should be observable. It will also be helpful if you can give the O/C/I a matrix of events by critical subtasks, so that the O/C/I knows where to look to detect trends, improvements, and deficiencies.

Materials used for the summary report to the unit. Once a unit has completed its training period, the O/C/Is should prepare a summary report to the unit leaders concerning their performance over the course of the training. This report should be as short, succinct, and easily readable as possible, if you expect anyone to use it. Therefore, you need to give the O/C/I specific guidance on how to prepare the report. If you can automate the process of aggregating exercise-specific observations to the summary level, by all means do so.

Materials used to program or configure the simulation for the scenario. This set of materials may include printed materials, computer tapes or diskettes, or other delivery media. It consists of whatever the selected simulation requires in order to set up the scenario for the exercise. This product is the means for inputting the appropriate specifications from the *Exercise Outline Worksheet* to the simulation. In some cases, the scenario will be built

directly on the simulation console, and will never be exported to another location; or if so, it will be built all over again. On some simulations, you can save the scenario to an electronic file of some sort (tape or disk) for future use or for export. You should have a permanent copy of the exercise scenario specifications--paper or electronic--in case the simulation-mounted version is lost. In most cases (e.g., SIMNET exercises), you need some sort of initial configuration specification sheet showing where on the terrain the simulators are initially placed.

Training management materials. As you develop the training support package for the O/C/I, you will find certain bits of information or guidance that do not fit neatly into any of the above five components. For example, you might want to give the O/C/I some instructions on preparing for training and working with the unit as they prepare, from the notification date to the day of training. You may want to provide guidance on how to interact with the unit in the AAR so as to facilitate discussion. Plan on putting that kind of umbrella guidance into an O/C/I handbook of some sort, and organize the O/C/I training (Section 4 of this manual) around the training management handbook.

It should be fairly obvious that this activity makes use of all of the information and development work that has gone on to date. This is the grand culmination of the development methodology, leading up to the implementation.

If, however, you discover any discrepancies between what should go into the training support package and what you have available, then you may need to revisit one or more of the earlier activities. Sometimes you'll just engineer the missing piece of material; other times you may need to make some more sweeping changes in order to maintain the correspondence among all of the package components.

Quality Review

In order to insure that all of the materials are correct and user-friendly, two formative evaluation steps should be initiated. One concerns expert review of the materials. Individuals who are experts on the simulation and its components should make sure that your exercise materials are appropriate for the technology; they should pay particular attention to the last set of materials described above--materials used to program or configure the simulation for the scenario. Individuals who are experts on the doctrinal issues for the mission should review the materials to be used during orientation, execution, and the AAR for doctrinal accuracy. Someone who is familiar with the needs and resource constraints of the target units should check over the advance materials and the summary report. And a review by instructional design experts can help you with the presentation of all of the information.

The other type of review involves tryouts. For the tryout in Activity 3.4, you used nonrepresentative participants; now you should be involving actual O/C/Is and units. In most respects, you want them to attempt to use the materials as they currently exist, but you will also be interrupting the exercise at times to determine what went wrong or to work around a fatal error. During the conduct of the advance visit and the exercise itself you will be collecting opinions and suggestions and discussing ways of fixing things that aren't yet right; after the training you will interview the O/C/Is and the unit members to get their reactions to

the training content and materials; you will be in touch with the unit after they receive their summary report to find out how useful it is to them.

In order to involve the O/C/Is in the tryouts, you need to train them in the roles and responsibilities specific to these exercises. Section 4 of this methodology guide discusses O/C/I training at length. Because you are still in the developmental stages of the program, you will also be at early stages in the development of the O/C/I training program. Don't try to provide a fully developed program of training for them at this point--the materials and even the scenarios may still change, and the O/C/I training should reflect the latest version of the exercises.

These two kinds of formative evaluation processes--expert reviews and tryouts--should be done for each set of training support package materials: those aimed at the unit (Activity 4.2) as well as those designed for the O/C/I (Activity 4.1). In fact, it's likely that you would want to include all materials in each expert review and tryout. All of the information is collected for the purpose of revising the materials. Once materials are revised, another tryout should be conducted, until all of the flaws are worked out or until your resources and time are expended. Try to allow for at least two rounds of tryouts with representative units in addition to the internal tryouts in Activity 3.4.

Activity 4.2 Prepare training support package components for the unit.

Product: Materials provided to the unit in the advance visit to assist with exercise selection, training schedule, and preparation for the training.

Input From: *Exercise Outline Worksheet* and attachments.

Input To: Not applicable.

Revise To: Any of the previous activities, if gaps or discrepancies are detected.

Quality Review: Expert reviews, tryouts with O/C/Is and representative units (formative evaluation) in conjunction with Activity 4.1.

Materials that are given or sent directly to the unit⁴ are contained almost entirely within the Advance Information packet and the summary report. For some applications, materials will also be required for the unit's use during conduct of the exercise.

Advance materials include descriptions of the exercise (and tables, if you have tables) and materials such as the OPOD and map for the unit to use in preparing for the training. The exercise descriptions should give the intent of each exercise or table, the level of difficulty in terms of METT-T, the critical subtasks and performance standards addressed in each, and the ARTEP-MTPs or FMs that form the doctrinal basis for the training. The description should also indicate how long each exercise or table is, and what unit personnel

⁴ This excludes materials sent to a unit member who is the designated O/C/I.

are required for performing the exercise. For example, if the simulation does not permit the fire support officer to participate during the exercise, then let the unit know that. All of this will help the unit select the appropriate tables for their own training needs; the materials are also useful as study items in preparing for the training.

If you haven't already prepared clean versions of the OPORD and map overlay, now is the time to do it. Given the task lists from the exercise descriptions and the commander's intent and enemy situation, the unit should be able to conduct map exercises, rock drills,⁵ and rehearsals before they ever get to the simulation. The O/C/Is can help the unit focus their preparation time on the critical aspects of the exercises. By the same token, you will tell the O/C/I how to tell the unit how to train, and you should also prepare instructions for the unit on how to prepare. Consider using a videotaped training preview and demonstration of the exercise or table execution.

Depending on the type of training that you're developing, you might also need to develop materials that the unit personnel will use during execution, such as prepared messages or written intelligence reports. In order to contribute to the fidelity of the simulation, you should make these look as much like the real article as possible.

The summary feedback report that provides a rollup of the O/C/I observations for the unit should be designed to be very short, incredibly user-friendly, and succinct. Most units who participated in RCVTP training said that the Take-Home Packages that they got in the past, from NTC or other training centers, were more likely to be used if they were short and easily interpretable.

The information that is used in preparing materials for the unit was specified when the Exercise Outlines were developed in Activity 3.4. Some of it was drafted earlier; for example, the task lists were constructed in Activity 2.3.

If the pieces that you need for the unit are not available, then you need to prepare them. If you look at the pieces and find discrepancies among them (e.g., task lists don't agree, OPORD and overlay don't match), then you'll have to return to the earlier products to resolve the differences. You cannot tolerate any discrepancies.

Quality Review

The expert reviews and tryouts described in Activity 4.1 should also include these materials developed for the unit. Unit personnel should be asked to comment on the effectiveness of the materials in helping them select a starting point, plan and prepare for training, execute the mission, and derive benefit from the summary report.

⁵ A rock drill is a rehearsal for a specific mission, movement, or other standardized procedure. It may be a map-based exercise, a sand-table (terrain relief) exercise, or a "live" exercise, where each individual plays his/her own part, but full equipment support is not required.

SECTION 4. OBSERVER/CONTROLLER/INTERACTOR TRAINING

An integral part of simulation-based structured training is the use of O/C/Is. The responsibilities for each of the three roles (observer, controller, and interactor) include:

- *Observers*--critically monitor the unit's performance and provide feedback in the form of AARs and summary reports.
- *Controllers*--operate the simulation and its associated components (e.g., simulation-user interface, operator console, recording mechanisms, communications, report generation devices).
- *Interactors*--play the role of notional unit commanders, enemy forces, other supporting elements that are to be represented by live players, or will be only partially simulated.

These individuals may be a dedicated training cadre who work exclusively with your training program or with a variety of programs. Sometimes members of the unit itself will serve as O/C/Is. For any of these situations, it will be necessary to train the O/C/Is. The training will usually involve familiarization with all of the training support package components, technical training on operation of the simulation equipment and on its specific use in the exercises, guidance on how to interact with the unit during training, and thorough indoctrination on the goals and intents of the training program and the individual exercises. The training should also include monitored practice on the simulation and training support package, with continual feedback. Although you hope that the trainers are content experts for the unit type and mission type, you should nonetheless devote some training time to studying and practicing observation of tasks and standards.

In preparing for O/C/I training, the SAT approach is as valid as it was for designing and developing the exercises themselves. The SAT phases in this application are as follows:

- *Analysis*--Determine training requirement, audience, and resources.
- *Design*--Outline the training in terms of time allotted to each objective, sequence of objectives, standards and their application, and training events; plan training support package components; and select training media and methods.
- *Development*--Prepare and try out the training support package components.
- *Implementation*--Deliver the training to the designated audience, that is, the O/C/Is themselves.
- *Evaluation*--Formatively evaluate the training process and achievement of objectives in order to refine the training; and summatively evaluate the training outcomes to justify continued delivery of the training.

This section discusses the application of the SAT processes in the construction and implementation of O/C/I training. Again, the information is based on experience with the RCVTP development. As the RCVTP materials were being created, a group of about 30 military and civilian trainers (called the RCVTP O/C Team) was trained to conduct the training, platoon through battalion, with ARNG units. Other personnel from remote training sites were also trained on the procedures for conducting platoon exercises on SIMNET. In all cases, the individuals were trained to be able to perform in all three roles (observer, controller, and interactor). Furthermore, these were full-time trainers, although the off-site trainers were not dedicated to RCVTP implementation.

The discussion presented here is not intended to lay out a complete O/C/I training program for you, nor will it tell you what is needed for the certification of O/C/Is. Every situation will be different with respect to roles and responsibilities, required skills, training support package aids, and required level of simulation skills. The purpose of this discussion is to describe the required processes of analysis, design, and development; to provide some guidance on formative evaluation; and to share lessons learned from the RCVTP.

PHASE 1. ANALYSIS

Training Requirements

- Roles (observer, controller, and/or interactor)
- Content/intent of exercises (mission, orders)
- Training objectives (tasks, standards)
- Materials (advance, execution, feedback)
- Selected simulation--operator functions
- Selected simulation--use in the exercises
- Interaction with trainees

Audience:

- Level of experience on training, simulation (general and specific to the selected technology), content area (unit type, mission)
- Organization (e.g., training cadre or unit personnel)
- Number of trainees

Resources

- Time for training delivery, delivery media/methods, instructional personnel

The three areas of emphasis in the initial analysis concern the training requirements, the audience, and resources.

Training Requirements

Under training requirements, the first issue concerns what role or roles these individuals will play. As described above:

- *Observers* monitor the training unit's performance during the exercises, assess it against standards, and provide feedback.
- *Controllers* are responsible for managing and administering the exercises and operating the simulation equipment.
- *Interactors* play roles as commanders of other notional units, enemy units, mortar sections, and so on.

It is possible, and even likely, that individuals will fill more than one role. For example, the RCVTP trainers on SIMNET exercises were usually both observer and interactor (as the higher level unit commander), or controller and interactor (as the fire support section). In the Janus Mediated Staff Exercises (JMSE) for battalion staff, the trainers were either observers or controller/interactors. You need to determine what you want them to do, and also what they already know how to do; that will define what you need to train.

You will need to provide some background about the scenario and some rigorous grounding in the intent of the training. You should spend time on the tasks and standards, too. You should not plan on training the trainers in the doctrinal basis for how the unit should execute the mission. Although it is certainly important that they know the subject matter, it should not be the purpose of the O/C/I training to teach doctrine. Some matters are better handled by adequate selection processes than by subsequent training.

Your training should cover every piece of material that the trainer handles or deals with (i.e., everything in the training support package). This will include advance materials for the trainer and the unit, execution guides, and feedback instruments. Training should also cover both operation of the selected simulation (how to turn it on and off) and utilization during conduct of the exercises.

Assuming the trainers will at some point interact with the unit, you should provide training on how that interaction should occur. For example, do you want the trainer to critique the unit? Instruct them as a platform instructor/lecturer? Engage them as discovery learners? During execution, should the trainers always operate in a tactical role (e.g., as the higher commander) or should they act overtly as trainers? Are there points where it is more appropriate to teach, to coach, or to mentor the unit? How do they move the unit toward the standard? Envision how you want the training to look, and plan on ways of imparting your vision to the trainers.

Audience

You will need to know the background and experience of the target audience in order to focus the training on appropriate needs. There is no point in spending a lot of time on a topic if they already have considerable experience in the area.

The experience and background of novice O/C/Is should be considered in terms of:

- *Training:* Have they conducted formal or small group instruction?
- *Simulation:* Have they conducted simulation-based training? On what simulation?
- *Content area:* How much do they know about this type of unit? This mission? The role that they will be filling as an interactor (if applicable)?

If you will be conducting the training periodically for new groups of O/C/Is, or for individuals as they come on board, the background and experience may be different with each iteration. If you anticipate this situation, the training design can be modular, so that different areas can be lengthened or shortened based on the training need. The resulting tailored training will be more efficient.

You also need to determine, in general terms, the organization or functions of the O/C/Is. For example, are they dedicated to the implementation of only this training? Or will they work with a variety of training programs and training functions? Are they drawn from among the unit personnel? If so, what is the basis for their selection? How often will they be conducting this training as O/C/Is? Knowing these things will help you determine whether to train them in just enough to get by, or whether to train them for a longer tour of duty administering the training. It will also help you make a recommendation for how often the O/C/I training should be repeated (if at all) to sustain their performance.

Resources

You should already begin to examine the resources and constraints for O/C/I training. These usually appear in the form of time available for actually conducting the training (does not include time to design and develop the training), media or methods that can be used for training delivery, and personnel to act as instructors.

You need to determine how much time you will have with these potential trainers, and whether that time will be as a block or as several blocks that are separated by days or weeks. This will affect how you sequence the training objectives and how you allocate time for each objective. A related issue concerns the function or functions that the trainers will perform (discussed above). If the trainers are unit members who are drafted as observers or controllers or interactors for one iteration of the training, then the available training time will be short. Your job will be to give them only what they need for the one iteration (e.g., specific METT-T-driven standards), as quickly as possible. If, however, they will be

conducting training over a longer period, either with their own unit or with many units, you will need enough time to train them thoroughly on all facets of the exercises.

You should identify the media or method resources available to you. To train observers, you should find a real or simulated unit to act as participants. For training controllers, you need access to the simulation control station. For interactors, you may need both the unit and the simulation controls, depending upon the interactors' responsibilities. You may also want to use video equipment, prepared videotapes, linked simulations, or other high-tech resources. Find out early what will be available, so you can design the training appropriately.

Finally, identify the instructor and/or instructional staff. Plan on enlisting an expert on the simulation operation. If the training will be delivered just one time, and you are the chief instructor, then the materials may require less detail than if the O/C/I training has to be standardized and exportable.

PHASE 2. DESIGN

Training Outline

Time allotted to each objective, sequence of objectives, training events

Training Support Package

O/C/I Handbook, job aids

Training Media and Method

Simulator/simulation and multimedia support
Classroom, classroom plus hands-on, or distributed
Individual or group

The three areas of consideration in designing the training are the training outline, the training support package, and the training media and method. The three areas are mutually supporting; each has to be examined and decisions must be made in light of the decisions reached in the other two areas.

Training Outline

In the outline, you are preparing the draft training schedule or agenda. It should indicate each training objective or topic, the time allotted for each objective, and the sequence of presentation. The training events or mode of presentation--platform presentation, discussion, hands-on practice, and on-the-job (OJT) training--should also be indicated.

We used each of the methods in the training for RCVTP O/Cs, with a heavy emphasis on monitored practice. Early phases of the training covered an overview of the program, an

introduction to the simulation from the unit's perspective and then from the operator's perspective, and a walk-through of the training support package. Later the training began to tie the pieces together, requiring that the training audience integrate the different pieces and use them in training a simulated unit. Finally, they (the O/Cs) participated as O/C/Is to train ARNG units while we (the developers) observed and monitored their work.

Training Support Package

You should plan on preparing some kind of hard-copy (paper) manual or handbook for the trainers. It should contain guidance on whatever the trainer is expected to do, including some or all of the following:

- Details of implementation procedures.
- Samples of materials and how to use them.
- Simulation equipment operating instructions.
- How to conduct the advance visit, execution, and AAR.
- How to prepare the summary report.

If the trainers fill different roles, then each role needs a separate handbook. If the trainers are cross-trained and will move among the roles, however, these can be separate sections within a single O/C/I Handbook. In the training support package for the training (Phase 4 of the development methodology), you should include job aids that will be used during administration of the program. In contrast to those exercise-specific aids, the handbook should be more of an umbrella training management tool. Training for the O/C/Is should be organized around this handbook.

You should also plan the job aids that will be provided to the O/C/Is for use during training. You should at least give them a copy of the training schedule, and possibly a list of names and phone numbers to be called if they have questions or problems later. Other aids include short guides to simulation operations that can be used as references, copies of slides used during the presentations, checklists of preparation steps, and the like. Some of the job aids will probably continue to be used as the O/C/Is conduct training for more units.

Training Media and Method

The final area of consideration in design concerns the training media and methods. You will certainly be using the selected simulation during the training, if only during the block of training on its operation and utilization. You will also probably want to use multimedia tools to hold their attention: overhead projection slides, videotapes showing the training being conducted, even (if you have sufficient resources) computer-assisted or computer-interactive training.

Although it is possible to conduct the training entirely from a classroom (even the simulation familiarization block), it is *not* recommended. Training of trainers has to include some hands-on practice, involving simulation, materials, and an audience (preferably a unit).

All of the above discussion has assumed that O/C/Is will be trained in groups. That is usually the most efficient approach if their schedules permit, and if you have sufficient simulation stations to allow for hands-on practice. But if the number of simulation stations is much less than the number of trainees (i.e., fewer than 1:2), or if the requirement for O/C/Is is very small (like one or two), or if there is frequent turnover in O/C/Is, then your training will likely be tailored for individuals rather than groups. This should not lead you to significantly alter the training plan except that your time allocations can be more flexible, tailored to each individual.

PHASE 3. DEVELOPMENT

Prepare Training Support Package

O/C/I Handbook, job aids, training aids

Pilot Test the Training

Expert review, target audience tryout

Prepare Training Support Package

You designed the training support package for the O/C/Is in the previous phase; now you need to prepare materials for training the O/C/Is on how to use the package. The materials will probably include the O/C/I Handbook, discussed above, as well as whatever job aids and training aids you think the O/C/Is can use. Before you use the O/C/I training materials in a training setting, you should obtain a review of the content. The types of experts who can help on this would be:

- Subject matter experts (in this case, experienced O/C/Is or your fellow training developers), who can verify that the training covers what O/C/Is need to know.
- Technical experts, who can focus on the simulation.
- Instructional designers, who can advise on the organization of the materials and the mode of presentation.

Pilot Test the Training

If there will be a large number of O/C/Is being trained, you should pilot test the training on a small group first. Pilot tests enable you to correct the most fatal flaws in the program with a relatively small investment of resources. Collect feedback, positive and

negative, and use it to revise the training before finalizing the package. (Also see Phase 5, "Evaluation.")

PHASE 4. IMPLEMENTATION

Plan

Prepare agenda, select facilities, determine instructor needs, determine training materials, notify trainees

Prepare

Reserve and set up facilities, rehearse instructors, copy materials, schedule trainees

Execute

Do it.
Reevaluate agenda daily
Consolidate loose ends daily, tie off
Observe and evaluate all aspects of training (see Phase 5)

Plan and Prepare

The temptation at this point is to say--you've designed it and developed it, now just deliver it. But implementation is usually made easier if you systematically work through the three activities in this phase: plan, prepare, and execute. The considerations listed above for planning and preparing are probably not exhaustive; if you've ever done this before, you know the likely problems and ways of dealing with them.

Execute

The activities listed under "Execute" may be less obvious than those shown for "Plan" and "Prepare." If the planning and preparation are done carefully, then the execution should be mostly "Do it." You should, however, be aware of and alert to three considerations: First, as you may have experienced, training times in schedules are estimates only. If one training block requires more time than planned, be flexible in making adjustments. The smaller and less diverse the group is, the easier it is to adjust the schedule based on training needs.

Second, take time each day or so to discuss the training with the group. Solicit their questions or comments, and try to determine whether they have a good understanding of what has been covered. Be willing to insert this discussion time whenever you feel that it is needed.

Third, perform formative and summative evaluations concurrently with the training implementation. This activity demands such great attention that we have made it the topic of Phase 5.

PHASE 5. EVALUATION

Formative Evaluation

Interviews and questionnaires to determine reactions; objective is to revise the training so training objectives are met.

Summative Evaluation

Interviews and questionnaires to determine training utility; objective is to justify training

The evaluation of training has two purposes: to refine aspects of the training program and to report on the measured success of the training. These two purposes are addressed by two types of evaluation: formative evaluation and summative evaluation⁶.

Formative Evaluation

The purpose of the formative evaluation is to discover what works well in the training, and what needs revision. The O/C/Is being trained are the most informative target for this evaluation. Use individual or small group interviews or questionnaires to get O/C/I reactions to the delivery, the agenda, the materials, the instructors, and training utility (whether they believe that their skills have improved). When you ask about perceived utility, be sure to obtain their estimates of their skill levels *prior* to the training; this may affect their response to questions about skill improvement. Formative evaluation data should be used directly in revising the training.

Summative Evaluation

Summative evaluations, on the other hand, are intended to be evaluative. The most convincing evaluation data would be measures of whether or not the O/C/Is achieved the objectives (a criterion-referenced test), whether the achievement translated into proficiency on the job (behavioral checklists or observation forms), and whether or not proficiency on those objectives results in better conduct of the exercises (data on the training unit achievements). If you have the time and resources, you should proceed with a full-blown data collection of this nature. If not, at least collect information from the training unit and their leadership regarding O/C/I proficiency in conducting the exercises. Ask the O/C/I leadership for their opinion of the value or utility of the O/C/I training as well.

⁶ This discussion of formative and summative evaluation is necessarily superficial; either topic could require a complete section in its own right. The interested reader is referred to Fitz-Gibbon & Morris, 1987.

Your summative evaluation report should become part of the file maintained on the training development. If training occurs frequently, then the summative evaluation should also be conducted periodically, probably on a smaller scale, to ensure that the training quality is consistently high and that the O/C/Is are attaining the performance objectives. Both of the purposes are aimed at ensuring that the structured simulation-based training delivers high quality training to the units.

SECTION 5. USING THE METHODOLOGY FOR TRAINING PROGRAM MODIFICATIONS

The methodology for development of structured simulation-based training was developed in the context of training development for platoon, company, and battalion tactical exercises. But its applicability is much wider. Although most of the examples reference mounted brigade elements (for which the RCVTP was developed), the methodology is also appropriate for simulation-based training in other types of units, with other missions. The general concept of structured, as opposed to free play, simulation-based training would apply equally well to any complex and rich training simulation which is capable of allowing free play. The structure provides a training environment that is controlled to allow for practice and evaluation of unit progress.

The development methodology is also useful for adapting existing simulation-based training exercises to other conditions. It is especially suited for guiding adaptations due to variations in unit echelon or type, enemy doctrine and organization, terrain, and simulation technology. The remainder of this section presents the ways in which extensions or revisions to training programs would be accomplished using the development methodology. Specific applications of the methodology are discussed to address modifications for different unit type/echelon, mission, enemy, terrain, and simulation system.

If you are beginning a modification of existing training, at least one of these parameters--unit type/echelon, mission, enemy, terrain, or simulation--will be the same in the new exercises as in the original. (If all parameters take on new values, then you are not modifying--you're starting over.) The first step in modifying the existing training (after a needs analysis that indicates why the modification is needed) should be in Phase 1 of the development methodology: documenting the initial decisions. As you note the specifics of those decisions, assess the degree to which they differ from the specifics of the original training development (the one you're modifying).

As was noted earlier, the methodology specifically indicates where and how the products of each activity are used in subsequent activities. When you are using the methodology to modify exercises, the *first* activity where a particular parameter is incorporated is where the *first* changed product will be required; all subsequent activities that use that product will require corresponding changes.

Thus, if the training is to be modified only for another type of unit (for example, for a scout or mechanized infantry platoon from an armor platoon; or for an armor company from an armor platoon), then Activity 2.1 must be repeated for that unit's task domain. Consequently, Activities 2.2 and 2.3 will result in a task list that is specific to that unit's domain. Subsequently, the mission must be constructed to exercise the unit's task domain, the exercise outlines and event lists must be based on the mission, and the training support package has to be tied to the outlines. If the original unit and the new unit have similar task lists, the changes will be minor, and the resulting training exercises will probably look a lot like the original. If the task lists are vastly different, then the entire training program will be different.

If the modification is intended to allow for presentation of a new enemy (other than the former Soviet-style, Warsaw Pact nemesis), the first place where changes will be likely is in Activities 3.1 and 3.2, when the mission is being formalized in a course of action. In approaching the modification, consider whether or not the training unit's missions are still appropriate, or indeed whether the training unit should confront that enemy. If you determine that the new threat is appropriate for the training unit type and echelon, and that the unit's mission is generally appropriate, changes would be required to the unit's OPORD, and possibly to the list of tasks that support the specific mission. The specific ways that the enemy then fights the battle need to be scripted according to the enemy doctrine, and the events in the exercise must be adjusted accordingly.

To modify a training program for a different locale (for example, from SIMNET NTC-based exercises to a Grafenfels-based set), the mission type may be unchanged, but the actual orders and control measures will need to be revised for that terrain. This will, in turn, cause the task list to be reviewed again, to ensure that the selected tasks for the mission are still appropriate. Some of the events, possibly most, will require adjustments; it will be difficult to have the battle unfold in the same way, with the same events and enemy presentations. Both the enemy and the training unit need to be closely watched during map exercises or simulation-driven pilot tests, to ensure that the terrain permits them to move or hide or fight as intended.

At times, you may want to transfer exercises that were designed and developed for implementation on one simulation to other simulations. The developer can use the development methodology, concentrating attention first on the task list (Phase 2) to select tasks that can be represented on the new simulation. If tasks drop out, then it will be necessary to adjust the exercises to reflect the reduced task list. If tasks can be added, they should be; but this will also require changes to the exercises.

In some cases, the terrain available on one simulation will not be identical to that on the other. The differences may be in appearance (more or less vegetation, roads drawn differently) or in area or locale (e.g., SIMNET represents a 50k x 50k area of the NTC; Janus uses a 100k x 100k area). As long as the new simulation contains the original simulation's area, you can stick with that terrain. If the new terrain is the less comprehensive, however, changes will be necessary.

Differences in the simulation capabilities can also affect the enemy's behavior; . . . associated activities (e.g., engineer functions during armor brigade exercises); and the critical subtasks that the O/C/I will want to observe for the AAR.

The other parameter that can be changed is the mission. This type of change, however, will almost always require that everything after Activity 2.2 be performed as a new effort, rather than as a modification. The unit's task domain and the refinements to the list on the basis of simulation capabilities should not be different, but everything subsequent to that is tied to the exercise mission.

In summary: The development methodology offers developers a systematic process for either new development or modification of previously developed programs. In many

situations, the developer can choose to either adapt an existing training program for a new set of conditions (terrain, enemy, etc.), or start anew from the first phase of the methodology. If more than one parameter is changed (for example, terrain and simulation), then new development may be indicated. Development of training for a new mission, however, will always require a completely revised set of exercises.

Examples From The RCVTP

In the RCVTP, exercises were designed for armor, mechanized infantry, and scout platoons. The development efforts were going on simultaneously, with extensive coordination between the three development teams. Therefore, each set (armor, mech, scout) could legitimately be considered an adaptation of the others; each development effort proceeded as though it were modifying existing exercises from the other efforts. Because the Tables of Organization and Equipment (TO&E) and doctrinal missions for the armor and mech platoons are different, their task lists and events lists are different; however, the orders, terrain used, control measures, and enemy behavior are much the same. For the scout platoon, however, the entire training program is noticeably different; they are obviously proceeding from a different higher level OPORD than are the armor and mechanized infantry.

Company, company team, and cavalry troop exercises were also developed. Again, the development of company and company team exercises was concurrent with platoon development, so that the armor platoon exercises and the armor company exercises are each modifications of the other. But the differences are little more than would be expected when the focus moves up a level, and when three platoons have to be planned and scripted (company level) rather than one (platoon level). Company team exercises are virtually identical to company exercises. Because the organization and mission of the cavalry troop are so different from that of the company, however, cavalry troop exercises are vastly different.

Current Extensions

Already there are four research and development efforts underway that are using and refining the development methodology. All are being performed at Fort Knox, Kentucky, under the guidance of the ARI-Armored Forces Research Unit. In one project, a third scenario, for Deliberate Attack, is being developed and added to the RCVTP library. The scenario will be designed for armored battalions (on SIMNET) and battalion staffs (using Janus-mediated exercises). Because the mission is different, the methodology will be used to design and develop completely new exercises rather than to modify existing exercises. However, the task list analyses performed in Activities 2.1 and 2.2 will be directly applicable.

Another project is extending all three RCVTP exercises to the brigade level. Again, both SIMNET and Janus will be used. The resulting exercise package is expected to be very different from the existing RCVTP exercise packages, due to the emphasis on staff performance, the wider array of staff participants, the limitations on SIMNET capabilities for exercising a full brigade, and the need to select a new locale in order to portray the entire brigade. Thus, again, new exercises are being developed, despite the similarities in the mission type.

A smaller effort within another larger program is extending the RCVTP training packages for export to Mobile SIMNET sites, with different SIMNET capabilities, and for export to distributed Janus configurations. Both efforts will necessitate some modifications in the exercises and associated materials. This effort is clearly a case where extension and modification are required, rather than new development.

Finally, the methodology will be used in the development of brigade-level exercises that involve combat support and combat service support, as well as combat maneuver elements; that provide training in the plan and prepare phases, as well as execution; that provide for focus on brigade staff diads, triads, and quadrads, as well as the full complement of brigade staffs; and that will be implemented on Janus, SIMNET, and also the Battalion and Brigade Simulation (BBS) system. This training will be designed for active component units, but will be built on the three scenarios being developed for the reserve component brigade exercises described above. The refinements to the development methodology that will be possible as a result of this project, as well as the three described above, should be extensive.

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LIST OF ACRONYMS

AAR: After action review
ADA: Air defense artillery
ALO: Air liaison officer
AO: Area of operations
ARI: Army Research Institute
ARNG: U.S. Army National Guard
ARPA: Advanced Research Projects Agency
ARTEP-MTP: Army Training and Evaluation Program Mission Training Plans
AT: Annual training
BBS: Battalion and Brigade Simulation
BLUFOR: Blue (friendly) forces
BOS: Battlefield Operating System
C/ST: Commander/Staff Trainer
CAC-TNG: Combined Arms Center-Training
CAS: Close air support
CCF: Critical Combat Function
CP: Command post
CS: Combat support
CSS: Combat service support
CTCP: Combat trains command post
DS: Direct support
EC: Exercise Controller
FM: Field manual
FORSCOM: Forces Command
FRAGO: Fragmentary order
FSE: Fire support element
FSO: Fire support officer
FSS: Fire support section

LIST OF ACRONYMS (continued)

IDT: Inactive duty training
JMSE: Janus Mediated Staff Exercises
LD: Line of departure
MBA: Main battle area
METL: Mission-Essential Task List
METT-T: Mission, enemy, terrain, troops, time available
ModSAF: Modified semi-automated forces
MWSTC: Mounted Warfare Simulation Training Center, Fort Knox
NAI: Named area of interest
NBC: Nuclear, biological, or chemical
NTC: National Training Center
O/C/I: Observers, controllers, and/or interactors
OCIC: Observer/Controller in Charge
OCS: Observer/Controller Workstations (SIMNET)
OPFOR: Opposing force
OPLAN: Operations plan
OPORD: Operations orders
RCVTP: Reserve Component Virtual Training Program
RTO: Radioteletype operator
S1: Adjutant section
S2: Intelligence section
S3: Operations and training section
S4: Supply section
SAF: Semi-automated forces
SAT: Systems Approach to Training
SIMNET: Simulation Networking
SME: Subject matter expert
TAI: Target area of interest

LIST OF ACRONYMS (continued)

TEWT: Tactical Exercise Without Troops

TO&E: Tables of Organization and Equipment

TOC: Tactical operations center

TRP: Target reference points

UPAS: Unit Performance Assessment System (SIMNET)

XO: Executive officer

APPENDIX A

THE METHODOLOGY OUTLINE

METHODOLOGY FOR DEVELOPMENT OF STRUCTURED SIMULATION-BASED TRAINING

PHASE 1. INITIAL DECISIONS

Activity 1.1 Document initial decisions.

Product: Completed *Initial Decisions Worksheet*.

Input From: External requirement to develop structured training.

Input To: All other activities.

Revise To: Not applicable.

Quality Review: Proponent review.

PHASE 2. DESIGNATE TRAINING OBJECTIVES

Activity 2.1 Identify task sources, tasks, and standards.

Product: List of tasks and task sources--see *Task List Worksheet*. (Documentation of why other obvious sources will not be used...)

Input From: *Initial Decisions Worksheet* (Activity 1.1), and official sources of task analytic data.

Input To: Activity 2.2--"Refine task list for simulation support."

Revise To: Not applicable.

Quality Review: Proponent review, training and doctrine agency review; after tasks are selected (Activity 2.3--"Select tasks that support mission").

Activity 2.2 Refine task list for simulation support.

Product: *Task List Worksheet* annotated to show tasks that can be fully or partially performed and observed on the simulation.

Input From: Domain list of tasks on *Task List Worksheet* (Activity 2.1). Information about the selected simulation.

Input To: Activity 2.3--"Select tasks that support mission."

Revise To: Not applicable.

Quality Review: Proponent review, training and doctrine agency review; after tasks are selected (Activity 2.3--"Select tasks that support mission").

Activity 2.3 Select tasks that support mission.

Product: Reduced task list--see *Task List Worksheet*. Annotated to show which tasks (or parts of tasks) will be performed and can be observed in the context of the mission, which tasks cannot be incorporated.

Input From: Reduced task list (after refining for simulation support) on *Task List Worksheet* (Activity 2.2). Any additional guidance on which tasks to train, such as a Mission Essential Task List (METL) (external to the methodology).

Input To: Activity 3.1--"Design training unit's mission."

Revise To: Not applicable.

Quality Review: Proponent review, training and doctrine agency review.

PHASE 3. DESIGN SCENARIO AND EXERCISE OUTLINE

Activity 3.1 Design training unit's mission.

Product: Draft of training unit's "concept of the operation" with sketch of graphic overlay and/or draft of unit OPORD. Applicable portions (parts 1, 2, and 3) of *Exercise Outline Worksheet*.

Input From: *Initial Decisions Worksheet*. *Task List Worksheet*, column 4 (selected tasks).

Input To: Activity 3.2--"Design higher-order mission." Activity 3.3--"Prepare context and specifications."

Revise To: Activity 2.3--"Select tasks for training," if tasks *cannot* all be accommodated in the mission(s).

Quality Review: Map exercises.

Activity 3.2 Design higher-order mission.

Product: Draft concept of the operation or draft OPORD with graphic overlay sketch, for one and two levels above training unit. Applicable portion (part 3) of *Exercise Outline Worksheet*.

Input From: *Initial Decisions Worksheet*. *Exercise Outline Worksheet*, part 3a(i) (Activity 3.1).

Input To: Activity 3.4--"Outline events." Phase 4--"Develop training support package."

Revise To: Activity 3.1--"Design training unit's mission," if higher mission cannot be designed to provide context for planned training for the unit.

Quality Review: Map exercise.

Activity 3.3 Prepare exercise/table context and specifications.
(Option--Partition exercise into tables.)

Product: Context, specifications, and execution details for exercises/tables. Applicable portions (parts 4a, 4b, and 4c) of *Exercise Outline Worksheet*.

Input From: *Initial Decisions Worksheet*. *Task List Worksheet*. *Exercise Outline Worksheet*, part 3 (Activities 3.1 and 3.2).

Input To: Activity 3.4--"Outline events."

Revise To: Activity 3.1--"Develop training unit's mission," if mission does not allow for selected task sequencing, or if partitioning results in tables that are too long, or short, or boring.

Quality Review: Simulation-controlled exercise.

Note: *If the exercise is not going to be partitioned, check the full exercise for task sequencing and prepare exercise context descriptions, unit specifications, and execution notes (see Exercise Outline Worksheet).*

Activity 3.4 Outline events.

Product: Event list showing cues, expected performance, critical tasks or subtasks. Applicable portions (parts 5 and 6) of *Exercise Outline Worksheet*. (If exercise is not going to be partitioned into tables, prepare the Outline, part 5, once for the overall exercise.)

Input From: *Initial Decisions Worksheet*. *Task List Worksheet*. *Exercise Outline Worksheet*, parts 1-4.

Input To: Phase 4--"Develop training support package."

Revise To: Activity 3.3--"Prepare context and specifications," if exercise or tables don't have enough scope for events that cue designated critical subtasks.

Quality Review: Tryout with knowledgeable personnel.

PHASE 4. DEVELOP TRAINING SUPPORT PACKAGE

Activity 4.1 Prepare training support package components for the O/C/I.

Product: Materials to support the O/C/I in the advance preparation with the unit, orientation to and execution of the exercise, delivery of the AAR, preparation of the summary report, and programming or configuring the simulation for the scenario.

Input From: *Exercise Outline Worksheet* and attachments.

Input To: Not applicable.

Revise To: Any of the preceding activities, if gaps or discrepancies are detected.

Quality Review: Expert reviews, tryouts with O/C/Is and representative units (formative evaluation) in conjunction with Activity 4.2.

Activity 4.2 Prepare training support package components for the unit

Product: Materials provided to the unit in the advance visit to assist with exercise selection, training schedule, and preparation for the training.

Input From: *Exercise Outline Worksheet* and attachments.

Input To: Not applicable.

Revise To: Any of the previous activities, if gaps or discrepancies are detected.

Quality Review: Expert reviews, tryouts with O/C/Is and representative units (formative evaluation) in conjunction with Activity 4.1.

APPENDIX B

METHODOLOGY JOB AIDS

INITIAL DECISIONS WORKSHEET

DATE: _____ UNIT TYPE/ECHELON: _____

Mission type(s): _____

Enemy type (tactical style, capability): _____

Terrain (general area): _____

Technology (and version): _____

Training target audience (full unit, personnel within unit): _____

Execution time (target, approximate): _____

Table structure (one exercise, multiple tables): _____

Number and nature of entry points (single or multiple entry points; proficiency-based or needs-based): _____

Additional notes; other decisions already made: _____

Maintain this worksheet as a record of development initiation and decisions.

TASK LIST WORKSHEET

DATE: _____ UNIT TYPE/ECHOLON: _____

TASK SOURCE (e.g., ARTEP-MTP, FM; give pub. date): _____

| Activity 2.1 | Activity 2.2 | Activity 2.3 | |
|--------------------------|--|------------------------------------|--|
| Task number and title | Can task (or part of task) be trained on the selected simulation? (Describe part) | Does task support mission type? | Select task (or part of task) if "Yes" on both questions. |
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Attach additional pages as necessary.

EXERCISE OUTLINE WORKSHEET

DATE: _____ EXERCISE: _____

1. Identifier
 - a. Unit (type, echelon)
 - b. Mission type
 - c. Enemy type
 - d. Technology/simulation
2. Training objectives (list or attach *Task List Worksheet*)
 - a. Tasks
 - b. Sources/References
3. Scenario Context (*Activities 3.1 and 3.2*)
 - a. Mission (brief descriptions)
 - i. Training unit's mission
 - ii. One level up
 - iii. Two levels up
 - b. Task organization
4. Narrative and graphic representation of partitions/tables (If exercise is not to be partitioned, do this for the full exercise.)
 - a. Context
 - i. Friendly situation
 - ii. Enemy situation
 - iii. Preceding events
 - b. Specifications
 - i. Training unit--identification, starting location
 - ii. Higher level--identification, location, how represented
 - iii. Subordinate --identification, location, how represented

- iv. Adjacent--identification, location, how represented
- v. Manned systems' status--system number and type, ID, location/azimuth/formation, maintenance/fuel/ammo status, etc...
- vi. Other systems' status--unit type, system number and type, friendly/enemy, location/azimuth/formation, capability, etc... *[Includes SAF, interactor-controlled systems, etc...]*
- c. Execution
 - i. Ending point--location and event
 - ii. Table Intent (unit reaction)
 - iii. Tasks covered in table (crosswalk)

5. Events [by table].

| Event number or description | Stimulus or Cue (causes unit to do something: Controller, interactor, or other actions; trigger point; etc...) | Unit Response (what the unit is expected to do) | Tasks/Critical Subtasks (observation points) |
|------------------------------------|--|---|--|
| | | | |
| | | | |
| | . | . | . |

6. Additional notes

Attach draft Concept of the Operation for training unit and higher level unit and draft overlay. Assign ID codes to tables.

APPENDIX C

APPLICATION IN THE RESERVE COMPONENT VIRTUAL TRAINING PROGRAM

APPLICATION IN THE RESERVE COMPONENT VIRTUAL TRAINING PROGRAM

PART 1. PLATOON-LEVEL TRAINING

This section describes the development of structured simulation-based training exercises for the Reserve Component Virtual Training Program (RCVTP) platoon-level training. Scenarios and training support packages were developed for armor, mechanized infantry, and scout platoons. The focus of the discussion in this section is the armor platoon, although the development process was the same for all three unit types.

Phase 1. Initial Decisions

Many of the initial decisions for the development of platoon-level RCVTP exercises were outlined in the government Statement of Work (SOW) that established the training development effort. For the most part, the givens were "best guess" guidelines that served as starting points for development. As the effort proceeded, and the development team gained both experience and the confidence of the client, these guidelines were loosened or adjusted. This evolution allowed the development team the freedom to experiment with and include some innovative approaches to training.

Activity 1.1 Document initial decisions.

Below are the initial decisions for the development effort as they were outlined in the SOW, as well as indications of how those decisions were adjusted as a result of later development work.

Mission types. The design of the RCVTP armor platoon exercises was part of a three echelon training design effort. The effort included platoon, company, and battalion-level exercises designed for training units using SIMNET. The initial SOW called for a cornerstone scenario at the battalion level that included the missions of Movement to Contact and Defend in Sector. The design methodology called for us to *derive* the appropriate corresponding missions and tasks for the lower echelon units that support the battalion missions.

The only missions designated in the armor platoon Army Training and Evaluation Program Mission Training Plan (ARTEP-MTP) (Department of the Army, 1988c) are attack and defend. This made the mission selection for the armor platoon rather simple, but did nothing to define exactly what the platoon would be doing during training. Detailed definition of the training tasks came later, during the partitioning of the scenario (Activity 2.3), when we grouped tasks together to form the initial tables.

Terrain. The National Training Center (NTC) terrain database was selected for use for all RCVTP training exercises. This was done in order to better prepare Army National

Guard (ARNG) units for the major event of their most likely post-mobilization training plan, a rotation to the NTC.

Enemy type. At the beginning of this effort, the Army was still in the process of defining a new set of possible enemy doctrines on which to focus training. In the absence of the new doctrines, we used the existing Soviet-style heavy division warfighting doctrine to define the tactics, formations, objectives, and actions of the enemy within our scenarios. This choice proved satisfactory since the ARNG units are familiar with and train against Soviet-style enemy as a matter of course.

Technology. All of the platoon exercises were designed for use on current SIMNET technology using newly developed Observer/Controller Workstations (OCS) for the control and observation of the exercises. The OCS includes ModSAF¹, a digital voice and image datalogger, Stealth (360° field of observation from a platform invisible to the unit), and the Unit Performance Assessment System (UPAS). The exercises were designed to make the best use of each of these parts of the available technology. It was also required that they be exportable to mobile SIMNET sites that have the same systems.

Training target audience. The training target for the armor platoon exercises was the entire platoon. The focus for observation and feedback, however, was on collective tasks only.

Execution time. The SOW called for exercise tables consisting of one hour in the simulator, and one hour of AAR and preparation time for the next exercise or table. The AAR/preparation time was further divided into 15 minutes for preparation, 45 minutes for the AAR. This is one of the areas where some latitude was given once trial runs began. In some cases, tables needed to be longer than an hour and in others, they could run short and still achieve the training objective.

Number of tables. The SOW called for a total of 18 exercise tables for armor platoons. With this defined as a requirement, we initially planned to partition the missions into 9 offense and 9 defense tables. However, in order to attend to the training of some fundamental tasks, we decided to develop three "fundamental" tables and only six defense tables.

Number/nature of entry points. The original concept was for each table to be a stand-alone training event derived from the battalion-company scenario and including some version of a crawl/walk/run progression. Units were to be able to enter at the beginning of any table. Our design resulted in sequenced tables grouped under exercises as discussed above. The tables were designed as stand-alone training events. During the initial unit trials, the RCVTP O/C team concluded that it would be best if units only entered the training exercises at the beginning of each set of exercises, that is, at the first table within the

¹ "ModSAF" refers to the modified semiautomated forces that can be generated and controlled at the OC workstations within SIMNET.

fundamentals, offense, or defense exercises. Their observations and conclusions were accurate and defensible; however, the materials as designed allow for a unit to enter the exercises at the beginning of any table.

Phase 2. Designate Training Objectives

Activity 2.1 Identify task sources, tasks, and standards.

In the case of armor platoon tasks, only ARTEP 17-237-10-MTP, *Mission Training Plan for the Tank Platoon* (Department of the Army, 1988c), and FM 17-15, *Tank Platoon* (Department of the Army, 1987) were identified as possible task sources. The tasks required of an armor platoon are relatively straight forward and are well defined in the above sources. At the outset, all of the armor platoon tasks were included as candidates for execution because all were possible within the framework of the battalion missions of movement to contact and defense in sector.

Activity 2.2 Refine task list for simulation support.

At first glance, few of the tasks seemed to be executable on SIMNET technology. We immediately began to screen the candidate tasks for trainability on SIMNET using the Burnside (1990) method of analysis. Looking back, it is obvious that some tasks could have been discarded without further analysis, since they entailed the use of equipment and materials not available on or in SIMNET. Examples include tasks performed under nuclear, biological, or chemical (NBC) conditions, emplacing or breaching obstacles (excluded due to time required to emplace), and dismounting (not available in quantity needed).

An important distinction needs to be made here regarding the inclusion of tasks even when some critical subtasks are not executable on SIMNET. The Burnside method tends to be exclusive, while our approach (after applying the Burnside method) was to be inclusive. This led us to include some tasks that are only partially trained on SIMNET.

The decision-making process involved having all of the tasks screened by two or more subject matter experts (SMEs), and then conducting a group session after all SMEs had had a chance to review all of the ratings. This group made the decision as to which tasks to include in the exercises, based on their military knowledge and familiarity with the training capabilities of SIMNET. This team approach proved to work well and was used throughout the development process when it came time to remove or add tasks based on trials.

Activity 2.3 Select tasks that support mission.

As stated above, all of the tasks were considered as candidates because they "fit" within the battalion missions. It is worth noting here, however, that the battalion concept of the operation was changed to include the company-level task, Support by Fire. This is one

instance of the give and take nature of our development effort. That decision affected not only the battalion and the company exercises, but caused a change to the platoon task selection as well, in that it caused us to add the platoon task, Perform an Attack by Fire.

Phase 3. Design Scenario and Exercise Outline

Activity 3.1 Design training unit's mission.

As noted above, the platoon missions were to "flow" from the company OPORDs that were to "flow" from the battalion OPORDs. The battalion orders included more than enough information to use in developing subordinate unit orders. To ensure that the "flow" was as smooth as possible, we developed company orders directly from the battalion orders and, in turn, developed platoon operations order narratives from the company orders. We chose a narrative format that replicated what a platoon leader would normally use to brief his platoon. The platoon narratives continued to change during exercise development. Some changes were made based on external review, while other changes were made to accommodate the inclusion of particular tasks at specific points during the operation.

These narratives served as the "scenario" driver for the platoon tables. This means we developed a complete story for the platoon using the narrative as a guide. For the offense, we used the narrative to wargame the entire scenario (the desired "battle" from start to finish) starting at the Assembly Area through to the end of the available graphics and terrain. For the defense, we used the narrative to guide the development of the scenario from the initial occupation of battle positions through to a counterattack launched to regain forward battle positions.

Activity 3.2 Design higher-order mission.

The platoon-level development team did not have to design higher-order missions, because of the requirement to use the battalion and company-level missions designed as part of the cornerstone scenario. This is not to imply that such development was not necessary, only that it was already being done within the RCVTP development work. However, because it was being done concurrently with the platoon exercise development, the final missions for platoon, company, and battalion are not entirely congruent; each continued to evolve to meet the needs of the training at that level.

Activity 3.3 Prepare exercise context and specifications.

While the narratives were being written, the battalion-derived scenarios were being partitioned into tables and exercises. Tasks were grouped together following the crawl-walk-run concept and overlaid on the battalion operational graphics. The beginning tables included easy tasks (as defined by SME analysis) conducted at a point in the battalion scenario where METT-T was simple (i.e., few if any enemy, easily negotiable terrain, no changes from the order as briefed). As the scenario proceeded, easy tasks which had been conducted earlier were grouped with more difficult tasks in order to increase the overall level of task difficulty

while allowing the participants the opportunity to repeat training on selected tasks. Additionally, the METT-T affecting the execution of the tasks increased in complexity (i.e., increase in enemy, difficult terrain, FRAGOs) to represent changes in mission), which in turn helped to define the performance standards.

It is important to note that not all of the tables designed under this effort were tied to the battalion operations. During the initial phases of the exercise design, it became apparent that some (if not all) of the ARNG units that would be using the exercises might need some practice on basic tactical tasks such as movement, actions on contact, and battle drills. With this in mind a set of Fundamental Exercises was developed to provide the opportunity for units to practice basic offense and defense tasks under the close supervision of an RCVTP O/C.² These exercises exist outside of the tactical scenarios used for the offensive and defensive missions and consist of graphics and cues for the execution of the required tasks.

Further observations indicated the need for basic familiarization exercises for the vehicle crews. As a result, we developed a series of one-hour tables that helped the crews to become comfortable with the simulated terrain and vehicles and allow them to practice navigation and target acquisition.

Even at this early stage of development, a change in one table or order could (and often did) cause a ripple effect of changes in other materials. Moving a task from one table to the next could require an addition or change to the narrative to ensure the right context was provided for the friendly and enemy actions. Further, as the battalion scenarios changed, the company and platoon narratives had to change to maintain the top-down flow of the missions.

Once the tasks by table lists and narratives were completed, work began on writing the exercise context and specifications. This proved to be a difficult effort but provided a substantial framework for the development of the exercise tables. For the most part, the context for the table being outlined was taken from the different OPORDs and the preceding tables. The orders included enough information to outline the enemy and friendly situations, and give a brief statement concerning the events preceding the start of the table. For the first table of each mission (offense/defense) all of the context came from the existing orders. For subsequent tables, much of the context came from the preceding tables. As the scenario unfolded, both the enemy and friendly situations changed based on events in previous tables. These results of previous tables were included as part of the context for each subsequent table.

The inclusion of information from previous tables served two purposes. First, it provided enough information to allow each table to be a stand-alone training event. Enough tactical context was available to the unit to enter the table without having conducted the preceding tables. Second, it helped maintain the contextual flow of the battle as it unfolded and units progressed from one table to the next.

² In the RCVTP, the trainers are referred to as observer/controllers (O/Cs).

Many of the specifications for the platoon tables remained constant throughout the entire set of exercises. The training unit, higher level unit, subordinate units, and adjacent units information changed only a few times during the exercises. The changes were detailed only if they impacted on the training unit's execution of the table.

The decision was made early on to begin each table with fully mission capable manned vehicle simulators, with full ammunition and fuel loads. None of the training on the selected tasks would have been enhanced by degrading the initial status of the training unit.

For the remaining activities, we used the OPORDs, overlays, NTC map, and micro armor to layout the units as stated in the OPORDs. This provided us with a very good tool to begin the work of detailed design.

For each table, the exact location and orientation of each manned vehicle simulator had to be recorded. The starting locations for the first table in each mission were chosen to represent the unit location as stated in the OPORDs. For subsequent tables, unit locations were selected to replicate the most likely ending location from the previous table. This effort was very tedious and time consuming; with each trial run, adjustments to starting or ending locations in one table caused a domino effect throughout the subsequent tables.

For the platoon tables, the other systems' status required us to state the exact enemy and adjacent friendly unit start points, end points, formations, orientations, gunnery competency levels and opening ranges, ammo and fuel loads, maintenance levels, and desired tactical actions. All of this information was later transferred to SIMNET plan sheets (the standard tool used to document specifications, build SIMNET files, and initialize manned simulators prior to beginning training).

Activity 3.4 Outline events.

This was the beginning of table execution development. We used the table task list to help identify unit actions and reactions in order to record the unit starting and ending locations and determine the appropriate enemy information. It was an easy step to move from the outline phase described above into the listing of events for a table. We now knew which tasks were to be conducted in the table, the unit starting locations, the mission or tasks assigned to the unit, and which critical subtasks were to be observed. For platoon table outlines, a format similar to parts 5 and 6 of the *Exercise Outline Worksheet* was used.

The events were written starting with a beginning cue (usually a verbal order from the O/C). The friendly, enemy, and O/C actions were then added that would cue the training unit to execute the desired tasks. For example, if the task was Execute Actions on Contact, the first cue was a verbal order from the O/C for the unit to conduct movement along a specified axis. Next, the corresponding enemy actions were added that ensured the training unit would make contact at a specific location. Additionally, we identified the specific critical subtasks that were to be observed and evaluated as the event took place.

It took great attention to detail and some imagination to do the step-by-step development of all of the cues and actions needed for a one-hour table. Making sure that the events within a table cued the required tasks and critical subtasks was always the main focus of the development effort.

Throughout the development of table events we conducted low-level map exercises with SMEs role-playing the friendly and enemy units. This was done to verify that all of the information in the outlines was accurate and that the cues actually stimulated the correct tasks. It is important to note that during this phase of development, ModSAF technology was not available; we had to rely solely on map exercises to test the table design. Needless to say, many changes were required once the technology became available for testing.

Phase 4. Develop Training Support Package

Early on, we developed a prototype training package outline that included a description of pre-training materials, on site training materials, take home package materials, and training management tools. This was needed to provide a format for development of training materials. As with all products, the content, format, location, and intended use of many parts of the package evolved throughout the development effort. Most changes were made in reaction to input from the users. These changes were oriented towards making the materials more user friendly and greatly aided the development effort. The end product was a very user friendly set of materials that supports the four elements of RCVTP training: pre-RCVTP planning and home station training; RCVTP execution; AARs; and the RCVTP take home package.

Activity 4.1 Prepare training support package components for the O/C/I.

See discussion under Activity 4.2 below.

Activity 4.2 Prepare training support package components for the unit.

While the methodology outlines two separate activities during this phase, we initially developed most of the training support package components in one effort and selectively identified the components that were needed for use by the unit. All of the materials developed and included in the exercise packages are discussed here.

Two O/C roles were identified: the O/C in Charge (OCIC) and the Exercise Controller (EC). The OCIC was responsible for the briefing unit leaders, communicating with the unit during the exercise in the role of company commander, coaching the unit as necessary, recording observations, and conducting the AAR. The EC controlled most of the SIMNET and components during execution and the AAR.

The materials were broken out into three groups: advance visit materials, exercise materials, and take home package materials. A list of the materials and a brief description of each is shown at the end of this section (Figures C-1 and C-2).

The majority of these materials are used by the RCVTP O/Cs to conduct, control, and record observations during table execution. Some materials that appear in the advance visit materials (e.g., narratives, overlays, and maps) are used by the unit and the O/Cs during table execution. All of these materials are packaged to provide the O/Cs with an exercise package that is simple to follow and use. The organization of the materials also underwent modifications during development. The final product is extremely user friendly and has worked very well.

The take home package consists of a cover letter and description of contents, an overview of all platoons trained (summary chart showing final subtask and comparing performance to standards), and detailed observations for each platoon. This last piece includes a summary narrative, the battle roster, the graphic overlay representation, and observation charts showing platoon subtask ratings for each table executed. This package is intended to aid the unit in planning and conducting future training either in SIMNET or using conventional training methods.

The overall organization of the exercise materials for the armor, mechanized infantry, and scout platoon tables involved 11 volumes. Some of the materials are presented in more than one volume because they have multiple purposes. This organization of materials was designed based on the needs of the training audience and trainers. The 11 volumes include:

- Handbook for O/Cs--general instructions for advance visits, execution and AAR, and preparation of the take home package.
- Tools and reference materials--including lists of training objectives, excerpts from the applicable ARTEP-MTP or FM, task-to-table crosswalk, and various job aids.
- Advance visit materials--descriptions of exercises to assist unit selecting exercises, map and OPORD, and demonstration videotapes.
- Take home package materials--generic letter and graphic representations.
- Familiarization course--instructions for O/C and vehicle commanders and course guides for crews.
- OCIC handbook for armor platoon exercises--table preview, event guide, and AAR materials.
- OCIC handbook for mechanized infantry platoon exercises--table preview, event guide, and AAR materials.
- OCIC handbook for scout platoon exercises--table preview, event guide, and AAR materials.

- EC handbook for armor platoon exercises--event guide and SIMNET plan sheets (specifications).
- EC handbook for mechanized infantry platoon exercises--event guide and SIMNET plan sheets (specifications).
- EC handbook for scout platoon exercises--event guide and SIMNET plan sheets.

Advance Visit Materials

| Materials | Purpose |
|---|---|
| Task to table crosswalk | Presents a matrix of the ARTEP-MTP tasks by exercise table. Used to determine which tables provide training on particular tasks. Aids unit in making decisions on exercise selection. |
| Exercise descriptions | Gives the tactical situation and difficulty level, and lists the tasks, critical subtasks and standards, and references. Aids unit in making decisions on exercise selection. Also used during unit preparation to provide context for rehearsals, and training emphasis. |
| OPORD narratives, overlays, maps | Provides detailed tactical information for the exercises. Used by unit to plan and conduct map exercises and rehearsals. |
| Graphic overlay representations | Schematic 8-1/2 x 11 inch representations that lay out the location of each table in relation to the graphic control measures and major terrain features. Used by unit to identify general location for the execution of each task within a table. |
| SIMNET vehicle crew manuals, Familiarization videotapes | Operating instructions for the SIMNET Combat Vehicle Simulators (CVSs). Unit should study to become familiar with the operation and switchology of the CVSs. Videotape also provides visual image of SIMNET environment. |
| Introduction and demonstration videotapes | Intro tape explains the steps units should take to prepare for conduct of the tables and how the tables, AARs, and take home packets are executed. Demonstration tapes show successful execution of selected portions of the tables. Should be used with the narratives, map, and overlays to prepare rehearsals. |

C-1. Advance visit materials developed for the RCVTP platoon exercises.

| Execution Materials | |
|--|--|
| Materials | Purpose |
| Mission Matrix | Used by the O/Cs to show all of the information regarding O/C to unit lash-up, CVS and OCS assignments, call sign and frequency allocation, exercise tables planned for each unit, terrain data base assignment, and critical timings. |
| Battle Roster | Used by the O/C to record the individual names and positions of the training unit. Becomes part of the take home package. |
| AAR Agenda Poster | Displays the agenda to be followed during every AAR. |
| Table previews | Read by the O/C to the unit. Provides the unit with the tactical table specific tactical situation, tasks and critical subtasks, starting positions, and allows for a terrain recon using the Stealth capability of the OCS. |
| Tasks/Critical Subtasks Posters | List the specific critical subtasks grouped by combat function that will occur in the table. Also lists the tasks from which the critical subtasks were derived. |
| Event Guides for the OCIC | A five column guide that gives the OCIC his script, the enemy (ModSAF) actions, expected platoon actions, critical subtasks to be observed and evaluated, a place for the OCIC to record a rating for each iteration of a subtasks, and space for comments/times to be recorded. Used as a reference during the AAR. |
| Event Guides for the EC | A three column guide that gives the EC the script, enemy (ModSAF) actions, and expected platoon actions. Used by the EC to control the ModSAF entities and assist the OCIC as required. |
| AAR Worksheet | A matrix with the critical subtasks listed by event. Provides the OCIC a method of recording rating for each iteration of a subtask from the Events Guide. Designed to show performance trends at a glance. |
| Tasks, critical subtasks, and standards by table | A modified excerpt from the ARTEP-MTP showing selected subtasks and standards that can be executed and observed in the simulation listed. Provided as a reference for the OCIC to use to help focus observations and comments. |
| SIMNET Plan Sheets | Has the manned simulator starting locations and the ModSAF instructions for the table. |

C-2. Execution materials developed for RCVTP platoon exercises.

PART 2. COMPANY-LEVEL TRAINING

The development effort for company-level training packages was conducted in almost exactly the same manner as the platoon effort. Both were conducted under the same SOW, and were accomplished by members of the same development team. While the development efforts were conducted under the same guidelines and by the same team that developed the platoon materials, the differences in missions, organizations, and tactics are significant enough to warrant discussion here.

The major differences between company and platoon exercises lie in the areas of target audience, task sources, tasks that support the mission, enemy specifications, and materials developed for the O/Cs. The discussion below highlights the differences between the platoon and company design and products.

Phase 1. Initial Decisions

Most of the initial decisions for the development of company-level RCVTP exercises were outlined in the SOW that established the training development effort, and were parallel to the decisions for platoons discussed in Part 1. For the most part, the initial decisions were "best guess" guidelines that were intended as contract obligations.

Within the RCVTP, exercises were to be developed for armor companies and company teams, as well as for the cavalry troop. Development for the company and team proceeded as a single effort, largely due to the fact that they share an ARTEP-MTP. The major differences lay in the OPOD narratives and in the platoon-within-company critical subtasks and materials, as described below. The cavalry troop exercises followed the same methodology, but had unique requirements in construction of O/C materials, as will be discussed.

Activity 1.1 Document initial decisions.

Below are the initial decisions for the development effort as they were outlined in the SOW, as well as indications of how those decisions were adjusted as a result of later development work.

Mission types. The initial SOW called for a cornerstone scenario at the battalion level that included the missions of Movement to Contact and Defend in Sector. The design methodology called for us to derive the appropriate corresponding missions and tasks for the lower echelon units that support the battalion missions. The missions used to represent the company's role were Movement to Contact and Defend. Detailed definition of the training tasks came later, during the partitioning of the scenario (Activity 3.3), when we grouped tasks together to form the initial tables.

Terrain, enemy type, technology, entry points. The decisions for company-level training were the same as for the platoon exercises: The NTC terrain database was selected for use; the existing Soviet-style heavy division warfighting doctrine defined the tactics,

formations, objectives, and actions of enemy; the exercises were designed for use on SIMNET; and the design called for sequenced stand-alone tables.

It was also required that the armor company exercises be exportable to mobile SIMNET sites that have the same systems and that units be able to conduct leader-only exercises at the Mounted Warfare Simulation Training Center (MWSTC) at Fort Knox. Since the mobile sites have only four combat vehicle simulators (CVSs) organic to the system, the export version of the company materials included instructions for using "tethered" (unmanned) ModSAF to fill in each platoon. Thus, company exercises at a mobile site (and leader only exercises) include the commander and his three platoon leaders (and their crews) in manned simulators with the rest of the company portrayed using ModSAF. Even in this mode of operation, the tasks selected for training occur and can be observed. A parallel in conventional training is the execution of a Tactical Exercise Without Troops (TEWT).

Training target audience. The training target audience for the company and company team exercises was the maneuver forces. The first sergeant and maintenance team were not included due to technology limitations and the desire to focus on maneuver tasks. The focus for observation and feedback at the company level was on collective tasks.

During company exercises, the main focus at the platoon level was on platoon critical subtasks executed as part of the company tasks. These critical subtasks were the same ones identified in the platoon development effort. This helped maintain the integrated, multi-echelon training focus of the RCVTP.

One additional area of feedback added as a result of the platoon O/Cs' experiences during trials was crew-level actions. As part of the AAR process during company exercises, the platoon O/C gives a brief platoon AAR immediately after the end of the exercise. Once this AAR is completed, the tank commanders attend the company AAR. This leaves the tank crews with the platoon O/C and provides a good opportunity to discuss crew-level actions such as fields of observation, scanning, target handoff, and so on. This portion of the platoon AAR proved to be very well received by units.

Execution time. The SOW called for exercise tables consisting of one hour in the simulator, and one hour of AAR and preparation time. However, the company-level AAR and preparation period tends to be longer than one hour. The AAR/preparation time for the company was divided into 15 minutes for platoon AARs and OCIC preparation, 45 minutes for the company AAR, and 15 minutes to prepare for the next table. This is one of the areas where some latitude was given once trial runs began. In some cases, tables needed to be longer than an hour; in others, they could run short and still achieve the training objective.

Number of tables. As with platoon exercise development, we developed three "fundamental" tables in addition to the nine offense and six defense tables, in order to attend to the training of fundamental tasks.

Phase 2. Designate Training Objectives

Activity 2.1 Identify task sources, tasks, and standards.

For the company-level training we relied mainly on FM 71-1, *The Tank and Mechanized Infantry Company Team* (Department of the Army, 1988f) and ARTEP 71-1-MTP, *The Tank and Mechanized Infantry Company and Company Team* (Department of the Army, 1988b) but were directed to explore other sources in determining which critical subtasks should be trained and observed. Only one other source was identified that included company-level tasks. It is a document titled *Combined Arms Battle Tasks* (Mullin, 1988). This document consists of "critical combined arms battle tasks that contribute to mission accomplishment" (p. 6). These tasks were derived through a collective front-end analysis conducted by SMEs at the NTC, the Combined Arms Center-Training, the Infantry and Armor Schools, and selected Forces Command (FORSCOM) units.

This document is very thorough and includes well written tasks, tasks requirements, and tasks elements. However, it was not included as a task source for two reasons. First, it contains no new tasks: The current tasks were reorganized and in some cases defined using clearer language. Second, the Battle Tasks books were not widely distributed. Most ARNG units would not have access to the documents and would be unable to refer to them during pre-rotation training. For these reasons, we relied on the current FM and ARTEP-MTP for selection of tasks and standards.

The remainder of the company tasks were considered for inclusion into the exercises and only excluded based on Activity 2.2.

Activity 2.2 Refine task list for simulation support.

This activity was conducted in the same manner as in the platoon development effort. The task list was refined by means of the process described in Burnside (1990), with the modification that tasks that are only partially trainable on SIMNET could be included.

Activity 2.3 Select tasks that support mission.

In the platoon effort, all of the tasks were considered as candidates because they "fit" within the battalion missions. However, many company tasks were not considered because they would not happen as part of the battalion Movement to Contact or Defend in Sector. This includes such company-level tasks as Perform a Raid, Breakout from Encirclement, Perform Ambush, Perform Air Assault, and Delay.

One item worth noting here is that the battalion concept of the operation was changed to include the company task, Support by Fire. This is one instance of the give and take nature of our development effort.

Phase 3. Design Scenario and Exercise Outline

Activity 3.1 Design training unit's mission.

The battalion orders included more than enough information to use in developing subordinate unit orders. To ensure that the "flow" was as smooth as possible, we developed company orders directly from the battalion orders, and in turn developed company operations. As with platoon orders, these continued to be refined throughout the development process.

Activity 3.2 Design higher-order mission.

The company-level development team did not have to design higher-order missions. We were required to use the battalion missions designed as part of the cornerstone scenario. This is not to imply that such development was not necessary, only that it was already being done within the RCVTP development work. However, because it was being done concurrently with the company exercise development, the final missions for platoon, company, and battalion are not entirely congruent; each continued to evolve to meet the needs of the training at that level.

Activity 3.3 Prepare exercise context and specifications.

The process for preparing the exercise context and specification details was identical to the process for platoon-level exercises, as discussed in Section 4.

Activity 3.4 Outline events.

This was the beginning of table execution development. While this effort was conducted in the same manner as the platoon development, it proved to be more complex because we were dealing with a larger unit and more enemy. It was obvious from the start that this work required two people while developing a set of platoon materials only required one person.

Phase 4. Develop Training Support Package

The contents of the company exercise training package included materials for: pre-RCVTP planning and home station training; RCVTP execution; AARs; and the RCVTP take home package.

Activity 4.1 Prepare training support package components for the O/C/I.

See discussion under Activity 4.2 below.

Activity 4.2 Prepare training support package components for the unit.

The materials developed for company and company team exercises were very similar in structure and content to those developed for platoon-level exercises. The major differences were due to the participation of platoons in the company-level exercises (armor platoons in company exercises, armor and mechanized infantry platoons in the company team exercises), and the resulting need to provide training support materials for their use. Throughout the volumes, we added platoon materials necessary to support the exercises. For the most part the required information was extracted from the platoon-level exercise materials and modified to meet the needs of the Platoon O/Cs and the training unit.

In the advance visit materials, the exercise descriptions included not only information on the company tasks and critical subtasks, but also listings of the platoon-level tasks and critical subtasks. The OPORD narratives were also different, because of the different higher level unit as well as the different ways of using a company and a company team.

Within the execution materials, we prepared versions of the table preview and exercise guide specifically for the use of the O/Cs who monitored platoons. We also constructed a matrix of events and possible critical subtasks for platoon O/Cs. Because each platoon would participate as part of the company, it was not possible to determine in advance what each platoon would be doing during the events of the exercise; much of that depended on the platoon's position in the company formation and the way that the company commander chose to execute the mission.

Cavalry troop exercises were also developed along the same lines. However, because some of the exercise participants operated from the command post (CP) rather than from vehicles, additional observer materials were required. Platoon-level materials and information were also provided for use with the armor and scout platoons within the cavalry troop exercises.

PART 3. BATTALION-LEVEL TRAINING

Phase 1. Initial Decisions

The majority of the initial decisions for the RCVTP battalion exercises were made prior to the exercise development team's involvement. The decisions and constraints addressed the unit/echelon, missions, terrain, enemy type, technology to be employed, and time constraints of the entire exercise. Figure C-3 at the end of this section presents the *Initial Decisions Worksheet* for the battalion exercises.

Unit echelon/type. Overall, the RCVTP plan included related exercises for platoon through battalion levels. At the battalion level, the focus included both armor-pure battalion and battalion task force.

Mission type. The identified missions were a Defend in Sector and a Movement to Contact. The battalion exercise was to incorporate a government furnished NTC Cornerstone scenario to provide a doctrinally correct and accepted operational framework for both of the exercise scenarios.

Enemy type. It was also determined in advance that the enemy would fight according to former Soviet (former Warsaw Pact) doctrine and tactics.

Terrain. The NTC served as the location for the exercises. On SIMNET, the NTC terrain representation comprises a 50 x 50 kilometer area.

Technology. The SIMNET battalion exercises would utilize the SIMNET system with its organic semi-automated forces (SAF), combat service support (CSS), fire support, and engineer modules as well as the organic Stealth platform and the ModSAF workstation augmentation. The use of the ModSAF (Version 1.0) workstation would also include the use of the DataLogger and UPAS feedback and evaluation tools.

Training target audience. Initially, the intent was that the full battalion (maneuver elements) would participate in the training. However, the actual capability of SIMNET at the MWSTC to support all battalion members was inadequate. At the time, there were 41 M1 (Abrams tank) simulators and 14 M2/M3 (Bradley Fighting Vehicle or Combat Fighting Vehicle) simulators at the MWSTC. Because this was not enough to support the entire battalion, certain positions would be fought by SAF units or vehicles.

Although the battalion personnel from the commander down to the platoon leader and platoon sergeant could be involved in the training, the focus was on the command group and staff section personnel. Experience with actual ARNG units conducting annual training (AT) or inactive duty training (IDT) at the MWSTC also led to decisions to make the exercises suitable for units that could not bring all members. This was accomplished through the use of alternative manning and personnel distribution plans.

Execution time. In order to give units sufficient time to rehearse exercises after their arrival at the MWSTC, to conduct the training mission, and to receive both formal and informal AARs, it was determined that each exercise should be approximately 4 to 5 hours in length. This time had to include not only the 2 to 2-1/2 hours in the simulation during execution, but also the preparation time (about 1/2 hour); an hour for informal AARs for the line companies, scout platoon, combat trains command post (CTCP), and the fire support element/fire support officer (FSE/FSO); and an hour, minimum, for the formal AAR to the command group and staff personnel.

Table structure, number and nature of entry points. No decisions had been made about the internal design of the exercises except to use the context of the cornerstone scenario and to try to partition the exercise to facilitate the use of the RCVTP format with any unit METL.

Phase 2. Designate Training Objectives

Activity 2.1 Identify task sources, tasks, and standards.

Although several sources of developmental work were identified, such as FM 71-123, *Tactics and Techniques for Combined Arms Heavy Forces: Armored Brigade, Battalion/Task Force, and Company/Team* (Department of the Army, 1992), we decided to use only ARTEP 71-2-MTP, *Mission Training Plan For The Tank And Mechanized Infantry Battalion Task Force* (Department of the Army, 1988a). The rejection of other sources was based on the requirement that the tasks, performance measures, and standards be based on accepted doctrine and be based on material available to the unit as part of their training and preparation.

Work on Critical Combat Functions (CCFs) at ARI's Unit-Collective Training Research Unit had appeared promising at the outset. The CCFs are intended to integrate battalion actions across Battlefield Operating Systems (BOS), in order to assist in analyzing performance on collective tasks. However, the CCFs were being developed concurrent to the RCVTP development, and were not yet ready for analysis or use.

Research on battlestaff integration and organizational competence (Olmstead, 1992) was also examined. Although the factors proposed by Olmstead were not used in designing the scenarios, they were useful for structuring the battalion staff AARs.

Activity 2.2 Screen tasks for simulation support.

The development team relied on the Burnside (1990) methodology to conduct its refinement of the mission and subordinate task lists. The task ratings obtained by means of the Burnside method were then compared to the preliminary exercise design parameters and an analysis of the results was conducted. In most cases, the results of the Burnside method were sustained. However, despite judgments in some important areas that full tasks were not

suitable for SIMNET (e.g., obstacle integration, CSS pre-stocking, and some aspects of command post operations), selected subtasks of those tasks could be integrated into the exercise.

Activity 2.3 Select tasks that support mission.

The basis for selection of the ARTEP-MTP tasks to be trained was FM 71-2, *The Tank and Mechanized Infantry Battalion Task Force* (Department of the Army, 1988e), Chapter 3, Offensive Operations, and Chapter 4, Defensive Operations. Contained in these chapters are sections delineating the sequence of an attack or movement to contact and a defense. Using the mission sequences from the doctrinal manual, a crosswalk analysis was performed with ARTEP 71-2-MTP to identify the exact battalion collective tasks contained within each sequence or segment of the selected battalion-level missions.

During this activity it became apparent that a further defining of the two missions would be needed to assist in focusing the task documentation and desired performance of the participating unit in each exercise. As a result, the Movement to Contact exercise was structured into five segments based on the doctrinal sequence:

- Tactical movement (from the assembly area to first contact).
- Fight a meeting engagement (performance of actions on contact by the lead battalion elements and the initial battalion maneuver).
- Conduct a hasty attack, assault, or hasty defense (depending on METT-T the battalion masses combat power on the main threat).
- Consolidate (establish security of the force; determination of further mission capability).
- Reorganization (performance of organic CSS functions; reestablish command and control).

The defend in sector exercise was divided into four segments:

- Battle handover (counter-recon battle; detection of the enemy force).
- Defeat the enemy's first echelon attack (conduct the initial main battle area (MBA) fight at the battle handover line).
- Defeat the enemy's second echelon attack (conduct the battle of destruction of the enemy main body).

- Reestablish the sector (conduct consolidation and reorganization plus any required tactical movement activities with the intent of reassuming the defend in sector mission from the initial battle positions).

Applying the collective tasks from the ARTEP-MTP to these mission segments gave the exercise development team its range of subordinate tasks to continue the exercise design.

Figure C-4 at the end of this section shows a portion of the *Task List Worksheet* resulting from work on the activities in Phase 2.

Phase 3. Design Scenario and Exercise Outline

According to the SOW, the scenario for the battalion-level exercises was to be based on the NTC cornerstone scenario. However, the cornerstone scenario and associated orders and overlays used at the NTC were conceptual at best and not in existence at all at the brigade and battalion levels. Therefore, the scenario for all battalion exercises had to be created by the development team to both fit into the general scheme of the NTC cornerstone scenario and to provide the details at the lower echelons that are required for a viable tactical situation for the exercises.

The additional time incurred in preparing the missing cornerstone orders and adding detail to the scenario resulted in an incremental approach to the development of the exercise scenario and outline. The full scale preparation of the outline began after the major decisions on unit courses of action and brigade and battalion graphic control measures had been made. All activities in the detailed development suffered from delays due to seemingly minor modifications in control measures (e.g., placement and revision of phase lines and positioning of battle positions). However, once the scenario and orders reached the state of completion assumed by the SOW, the completion of exercise outlines was quickly accomplished.

Activity 3.1. Design training unit's mission.

Designing the unit's mission, insofar as the tactical battle was concerned, was relatively easy. The mission sequencing from FM 71-2 and the mission tasks and subtasks from the ARTEP-MTP provided the framework of the conduct of the ground operation. The initial focus was on the maneuver aspects of the battle. Subsequent refinements to the exercises based on the preliminary trials led to the integration of all combined arms (e.g., fire support and engineers) in the mission design.

Activity 3.2. Design higher-order mission.

The requirements for the design of the higher-order unit mission go far beyond the brigade OPOD when developing a battalion-level exercise. The entire brigade battle must be logical and doctrinally correct in its application in *each iteration* of the exercise. The battalion commander and staff need be able to track adjacent unit operations and rely on intelligence input from adjacent units. Therefore, the interactor cell must include O/Cs to

represent these activities. The higher unit mission forms the basis for the requirement to "play-out" the operations of the entire brigade, including the activities of the adjoining battalion and the reserve battalion. Because the other flank unit (battalion) was in an adjacent brigade's area of operations (AO), that unit's actions had to be wargamed out as well; and all had to be done under the aegis of the parent division.

It is inherent in the activities of the battalion that they must interact with brigade. While this is true of all subordinate units with their higher echelon, it is a more complex operation at the battalion level, involving staffs, multiple nets, and separate combat service support organizations. This complexity meant that considerable attention had to be given to the details of the entire brigade operation. Moreover, some staff tasks would only occur without fail if brigade initiated or required certain actions. The whole situation is exacerbated by the fact that the higher the headquarters, the fewer control persons exist with actual experience to role play those headquarters personnel with conviction. It became necessary to prepare not only scripted message traffic to insure compliance with the brigade/division order but also to prepare extensive guidance to deal with unscripted and unpredictable situations.

Activity 3.3. Prepare exercise context and specifications.

Using the exercise structure determined during Activity 2.2, the preparation of the exercise segments was easy to organize and develop in a systemic flow. The main benefit of partitioning the two exercises into segments was, in the final analysis, to make the development workload more manageable. By sequencing the exercise into its various segments, the development team was able to accomplish development for several segments simultaneously (e.g., the OPFOR order of battle and tactical plan was designed concurrently for all segments of the defend in sector exercise rather than in a slower linear method). The integration of the combat support and combat service support assets was able to be applied by BOS across all segments of the appropriate mission as described above and/or keyed by terrain location of select dominant terrain that affected one or more exercise segments. By the systemic approach, all exercise enhancements and possible modifications were explored in a wargaming technique or as a assigned tasking in preparation for finalizing the exercise content.

Activity 3.4. Outline events.

Following the wargaming of the two exercises and recording the decisions of the various tactical or training options contained within the exercises, the mission outlines of the two exercises were prepared. These mission outlines proved to be the key documents of the development process because they (or an abbreviated version of the outline designated the "exercise training event matrix") were the foundation of all subsequent development. In fact, the exercise training event matrix became a section in every O/C workbook developed for the administration and implementation of the battalion-level exercises. The mission outlines insured that all exercise events were in correct sequential order as described in FM 71-2 that the appropriate task documentation was referenced, that the correct performance standards were used for observation, and that the all controller/interactor functions (e.g., OPFOR tactical

scheme, brigade interactor actions) were standardized and supported the exercise design training objectives.

Figure C-5 at the end of this section shows a section of the *Exercise Outline Worksheet*, as completed for the Defend in Sector exercise.

Phase 4. Develop Training Support Package

Activity 4.1. Prepare training support package components for the O/C/I.

The documentation required to support the administration and conduct of battalion SIMNET exercises is extensive. An overall Training Guide was developed to cover the management of the exercise including the scheduling of SIMNET, allocation of resources, site preparation, controller preparation, and unit preparation.

For the conduct of the exercise, individual workbooks were constructed for each of the 12 O/C participants:

- Senior O/C
- EC
- Higher Headquarters and Adjacent Unit Controller
- Fire Support Controller (acts as brigade FSO, mortars, direct support (DS) artillery)
- OPFOR Controller
- Main CP Observer
- CTCP Observer
- Line Company Observers (A/B/C/D)
- Scout Platoon Observer

The individual workbooks were tailored to the particular O/C roles, and as a result each book was distinctly different from the others. The Tables of Contents for one of the books is shown in Figure C-6.

All of the required SIMNET plan sheets, detailing the simulation specifications, are contained in a *SIMNET Plan Sheet Workbook*. Plan sheet specifications were taken from the exercise outlines, and included initial locations (grid coordinates), maintenance, fuel, and ammunition status, firing capabilities, and preplanned routes for SAFOR units and vehicles.

Activity 4.2. Prepare training support package components for the unit.

The focus of RCVTP SIMNET battalion-level exercises was on the execution phase of the combat operation. As a result, in order to ensure standardized conditions for training for all units, and to enable the simulation to be fully specified, the execution plan for all units

was the same, and was provided as part of the RCVTP materials. The required documentation for each of the two missions, for the battalion and battalion task force, was contained in an *Exercise Orders Book*, and included:

- Full battalion and task force OPORDs with Annexes for Organization, Intelligence, Engineer, Fire Support, and Combat Service Support.
- The commander's intent, along with a decision support template for the staff.
- Overlays depicting control features, named areas of interest/target areas of interest (NAIs/TAIs), target reference points (TRPs), targets, and obstacles.
- A brigade OPORD, again with all supporting Annexes.

The documentation also included enough supporting information to show the unit leadership how the course of action was developed, using the nine steps in the deliberate decision-making process. Thus, although the unit could not execute its own plan in the RCVTP training, unit leadership could go through the planning process and then compare their plan to the RCVTP plan.

Additionally, an *Orientation Guide* was designed and developed to be sent to the participating unit to facilitate determination of the structure of its RCVTP battalion-level training. This guide contained descriptions of the different exercises in the RCVTP library along with guidance on how to select the appropriate type of training; discussion of the considerations in determining manning requirements; and a videotaped introduction to the RCVTP and SIMNET.

As a tool for helping the units prepare for the RCVTP at their home stations, videotapes showing successful execution of the exercises were prepared. These videotapes were drawn from actual SIMNET displays, and presented exemplary performances for each of the selected tasks, in the context of the RCVTP scenarios.

INITIAL DECISIONS WORKSHEET

DATE: 1 Oct 93

UNIT TYPE/ECHELON: Ar Bn TF

Mission type(s): Defend in Sector

Technology: SIMNET with ModSAF version 1.0

Training target (personnel within unit or full unit): Full Armor Battalion/Task Force

Execution time per table/segment: To be Determined (entire Defend in Sector exercise not to exceed one day)

Number of tables (or total execution time): 4 Segments: Battle Handover, Defeat 1st Echelon, Defeat 2d Echelon, Re-establish Sector

Number/nature of entry points (proficiency; all stand-alone, single entry point, or other):

1 entry point per segment (mission based), exercise can be run as a continuous exercise from the start of the first segment or divided among the subordinate segments depending upon the training objectives of the unit commander.

Additional notes, other decisions already made: OPFOR will be a full Motorized Rifle Regiment (MRR), Regimental Artillery Group (RAG) will be notionally portrayed (due to entity limitations of SIMNET system), OPFOR MRR will be deployed using standard March formation. Segment times will be determined by length of time to execute the doctrinal requirements of the phases of the Defend in Sector mission.

Defend in Sector exercise will be sequenced after Movement to Contact exercise.
Coordinate locations, enemy presentation.

Figure C-3. *Initial Decisions Worksheet* for battalion exercise, Defend in Sector.

TASK LIST WORKSHEET

DATE: 7 Oct 93

UNIT TYPE/ECHOLON: Arm Bn TF

TASK SOURCE: ARTEP 71-2-MTP (10/88), FM 71-2 (9/88)

| Activity 2.1 | Activity 2.2 | Activity 2.3 | |
|---|---|---------------------------------|---|
| Task number and title | Can task (or part of task) be trained on the selected simulation? (Describe part) | Does task support mission type? | Select task (or part of task) if "Yes" on both questions. |
| 7-1-3009, Defend | yes | yes | yes |
| 7-1-3010, Cover passage of lines | yes | yes | part Passing unit will be TF Scts, not covering force |
| 7-1-3012, Withdraw under enemy pressure | part Cannot replicate smoke | yes | yes |
| 7-1-3023, Consolidate | part Cannot replicate dismounted OPs, patrols | yes | yes |
| 7-1-3022, Reorganize | yes | yes | yes |
| 7-1-3004, Move tactically | yes | yes | yes |
| 7-1-3008, Counter-attack by fire | part CAS not replicated; CL V resupply notionally replicated; movement control techniques not replicated | yes | yes |

Figure C-4. *Task List Worksheet* segment for battalion exercise, Defend in Sector.

EXERCISE OUTLINE WORKSHEET

1. Identifier

- a. **Unit (type, echelon):** Armor Battalion/Task Force
- b. **Mission:** Defend in Sector
- c. **Technology/Simulation:** SIMNET with ModSAF version 1.0

2. Training Objectives (list or attach *Task List Worksheet*)

a. Tasks:

- 7-1-3009, Defend
- 7-1-3010, Cover Passage of Lines
- 7-1-3012, Withdraw under Enemy Pressure
- 7-1-3023, Consolidate
- 7-1-3022, Reorganize
- 7-1-3004, Move Tactically
- 7-1-3008, Counter-Attack by Fire

- b. **Sources/References:** ARTEP 71-2-MTP, FM 71-2, FM 71-123

3. Scenario Context

a. Mission (brief descriptions)

- i. **Training unit's mission:** TF 1-5 AR defends in sector from NK253158 to NK286245 to NK548181 to NK548080 NLT H-hour, D-day, to destroy enemy forces attacking into sector allowing no penetration of PL Wheeling. On order, re-establish defense positions along PL Phoenix.
- ii. **One level up:** 3d Bde, 52d Mech Div conducts a defense in sector to block all attempted enemy penetrations into the JTF lodgement area in zone.
- iii. **Two levels up:** 52d Mech Div conducts a defense in sector to guard the western edge of the JTF lodgement area NLT H-hour, D-day.

b. Task organization

| | |
|---------------|----------------------|
| Co A | TF Control |
| A/1-5 AR | Sct Plt/1-5 AR |
| Co B | 1&2/2/C/52d MI (GSR) |
| B/1-5 AR | COLT 2/1-42 FA |
| TM C | Hvy Mortar/ 1-5 AR |
| C/1-80 IN (-) | A/523 EN (DS) |
| 3/D/1-5 AR | 1/C/1-441 ADA (V/S) |
| Co D | 1/C/1-441 ADA (S) |
| D/1-5 AR (-) | |
| 3/C/1-80 IN | |

Figure C-5. *Exercise Outline Worksheet* for one segment of the battalion Defense in Sector mission.

EXERCISE OUTLINE WORKSHEET (Continued)

4. (For full exercise)

a. Context

- i. **Friendly situation:** TF 1-5 AR has been directed by 3d Bde, 52d Mech Div to prepare a MBA defense in sector. The division cannot establish a CFA in front of the brigade sector prior to the expected enemy attack. TF 1-80 is to the north and 2d Bde, 52d Mech Div is to the south. The JTF lodgement area and TF 1-25, the brigade reserve, is to the rear. The 3d Bde is to block all attempted enemy penetrations into the JTF lodgement area.
- ii. **Enemy situation:** TF 1-5 AR is opposed by the 90 MRR, a first echelon regiment of the 67 MRD. The 90 MRR is expected to conduct a supporting attack into the TF 1-5 AR sector. During this segment OPFOR activity will consist of division and regimental recon elements (notional), a dismounted infantry company, two combat recon patrols (CRPs) of the advance guard MRB, the forward security element (FSE) and the advance guard MRB main body of the regimental 1st echelon. The OPFOR course of action will be to cross PL QUINCY into the TF sector with one MRB in advance guard formation. The recon elements attempting to infiltrate the TF zone to identify the location and composition of the MBA were destroyed (notional). The dismounted infantry company will attack to secure key terrain in the MBA to support the regimental attack. The regimental FSE will attempt to secure one of the passes through the high ground along PL AUSTIN. Once past PL AUSTIN the 90 MRR will try to penetrate the MBA and attack into the USJTF lodgement area or provide supporting combat power to the 67 MRD main effort to the south.
- iii. **Preceding events:** Initialized in defensive positions in sector and along PL QUINCY.

b. Specifications

- i. **Training unit:** see subordinate unit locations below.

Main CP at NK478145.

Combat Trains at NK525105.

Task Force Commander and S-3 at NK525105.

Higher level unit:

3d Bde, 52d Mech Div, notional on Bde Cmd, Bde O&I, and Bde A&L radio nets.

Subordinate units:

Co A defending in sector from NK278139 to NK368213 to NK361096 to NK399195.

Co B defending from BP 12 (NK424135).

Tm C defending from BP 13 (NK429155).

Co D defending from BP 14 (NK433110).

Scout Platoon screening from NK263176 to NK288239 and NK308122 to NK80095.

Heavy Mortar Platoon at NK368154 and NK441153.

Main CP at NK478145.

Combat Trains at NK525105.

Task Force Commander and S-3 at NK525105.

Adjacent units (notional): TF 1-80 is to the north; 2d Bde, 52d Mech Div is to the south.

Figure C-5 (continued). *Exercise Outline Worksheet*, continued.

EXERCISE OUTLINE WORKSHEET (Continued)

ii. Manned systems' status:

4 M1s, 13 M2s at maintenance level 1; Ammo mix--40 SABOT/14 HEAT (M1),
900 25mm/7 TOW (M2); Fuel at 100%

iii. Other systems' status:

OPFOR:

Infantry Company--6 Infantry squads.

2 CRPs: Each w/ 3 BMPs and 2 BRDM-2s at maintenance level 1; ammo TBD.

FSE: 4 T-72s, 9 BMPs, 6 2S1 howitzers, 8 120mm mortars, 1 ACRV, 1V13, 1 ACRV
1V14, and 4 BRDM-2s at maintenance level 1; ammo TBD.

AGMB: 9 T-72s, 27 BMPs, 3 BRDM-2s with AT-5, 12 2S1 howitzers, 2 ACRV, 1V13, 2
ACRV 1V14, 2 ZSU 23-4s, 4 BRDM-2s; maintenance level 1; ammo TBD.

Competency: BLUFOR--Competent level; opening range 2000m.

OPFOR--Novice level; opening range 1500m

c. Execution

i. **Ending point:** PL LEAVENWORTH vic NK470150. Move to reoccupy BPs along
PL PHOENIX.

ii. **Table Intent (unit reaction):** This exercise is designed to have the unit execute all
battalion collective tasks associated w/ doctrinal execution of defend in sector mission.

iii. **Tasks covered:** See part 2a, above.

Figure C-5 (continued). *Exercise Outline Worksheet, continued.*

EXERCISE OUTLINE WORKSHEET (Continued)

5. Events [by table].

| Stimulus or Cue | Unit Response | Tasks/Critical Subtasks |
|---|---|--|
| Event 1. Establishment of defensive sector. (Cue: Exercise initialization). | Report REDCON status | <ol style="list-style-type: none"> 1) Command & control (maintain communications/ establish CP). 2) Control of indirect/direct fire (sighting of weapon systems/verification of control measures). 3) Fratricide prevention (verification of control measures). 4) Reporting (SITREP at exercise initiation) |
| Event 2. SPOTREP from Tm C in BP 13. (Cue: Contact with dismounted infantry.) | Actions on Contact/ Report to Higher HQs | <ol style="list-style-type: none"> 1) Command & control (maintain communications/see the battlefield/analyze intelligence). 2) Control of indirect/direct fire (employ fire support). 3) Reporting (combat intelligence). |
| Event 3. SPOTREP from Scout Platoon screen along PL QUINCY (Cue: Contact with lead enemy elements (CRPs).) | Increase MOPP status, commence monitoring activities /Report to Bde | <ol style="list-style-type: none"> 1) Command & control (maintain communications/ see the battlefield/analyze intelligence). 2) Coordination/dissemination of information (react to persistent chemical attack/NBC report). |
| Event 4. Contact with lead enemy elements (CRPs) (Cue: SPOTREP from Scout Platoon screen along PL QUINCY.) | Actions on Contact / Report to Bde | <ol style="list-style-type: none"> 1) Command & control (maintain communications/ see the battlefield). 2) Deception/ counterrecon (perform surveillance). 3) Reporting (combat intelligence). |

Figure C-5 (continued). *Exercise Outline Worksheet, continued.*

**Exercise Controller Workbook
Contents**

Purpose
Reserve Component Unit Profile Data Chart
Telephone Inquiry Record
Exercise Preparation and Initialization
OPFOR Operation Graphics
Exercise Intervention Guidelines
Guidelines for Responding to Unit Requests for Information and Support
Master Overlay List
Battalion SIMNET Frequency List and SOI Extract
Operation Orders
Decision Synchronization Matrix Instructions
Exercise Training Event Matrix
Message Traffic
RCVTP Battalion AAR Schedules
Battalion SIMNET Plan Sheets
UPAS Integration Plan

Figure C-6. Table of Contents for *RCVTP SIMNET Exercise Controller Workbook*.

PART 4. BATTALION STAFF TRAINING

Phase 1. Initial Decisions

As part of the RCVTP program, we were tasked to develop a structured training program for armor battalion staffs. Four specific directives were presented as part of the design specifications:

- The program should utilize Janus simulation technology.
- The training should be "exportable."
- The training should be conducted in "about four hours."
- The training had to be compatible with other components of the RCVTP then under development.

Immediate problems were encountered in the determination of the actual technology and in gaining access to Janus systems. Initial requirements called for the use of a particular version of the Janus simulation technology known as Janus (A), but it was later determined that it would be necessary to switch to a different system known as "ARPA Janus" (the Janus system developed by the Advanced Research Projects Agency (ARPA)). The two systems are comparable, but not compatible.

Greater problems were encountered in gaining access to the Janus systems: The site for the RCVTP development (Fort Knox) was not scheduled to receive the actual ARPA Janus systems until January 1994. Contractual timelines and scheduled availability of units for tryout dictated an initial operational tryout in February 1994. This meant that much of the development would be based on engineering descriptions of the ARPA Janus system supplemented by a one week, off-site ARPA Janus operator's course attended by the primary RCVTP developers.

Compatibility with the other parts of the RCVTP was insured by adopting the same offensive and defensive scenarios that were the basis for those developments (movement to contact and defense in sector). As with the other RCVTP components, the staff exercises would involve only execution, rather than the more traditional staff planning focus.

Other decisions were made based on an analysis of the training requirement and the training audience. The analysis identified the training focus as beginner-to-intermediate staffs with at least minimal individual proficiency, who would be functioning as a unit or section with intra-staff coordination requirements. Staff work in execution is not easily segmented; it requires some continuity and flow. We therefore decided to make each exercise (movement to contact and defense in sector) a single exercise, with a single entry point, and to treat all participants the same with respect to experience and expertise level.

Finally, since the composition of the units is somewhat transparent within the requirements of efficient staff functioning, we decided to limit the development to a single organizational entity (Armor heavy task force).

The requirement to remain compatible with the remainder of the RCVTP dictated the general terrain location, as well as the general capabilities and intent of the enemy. Specific terrain detail and considerable enemy conduct and execution had to be developed as part of this phase. Enemy organization, composition, and competency was based on the *Heavy Opposing Force (OPFOR) Organization Guide* (Department of the Army, 1994). It is significant to note that although the scenarios were wargamed on maps and had been implemented in SIMNET, there were still significant differences in the Janus database that had to be accounted for in the final design phase.

The initial decisions included a plan to focus on participation by *complete* staffs including all assistants, specialists, radioteletype operators (RTOs), and clerical personnel. Special staff were also included (e.g., air liaison officer (ALO), chemical officer, signal officer, logistics officer). Later analysis showed that few ARNG units (or active units for that matter) would travel to the RCVTP with a full and complete complement of participants. Participation requirements were therefore restated to reflect the *minimal* participation required, with provisions for accommodating anything up to complete staffing.

A very early decision was made to make the training experience as realistic for the participants as possible. This meant that participants (unit personnel) would operate in a CP or CP-like setting and would *not*, themselves, operate on the Janus simulation. Instead, Janus would serve to drive real time events that would, in turn, elicit staff actions and reactions. For this reason, the exercise was called a *Janus Mediated Staff Exercise* (JMSE) to emphasize that the participating unit would not be involved directly in the simulation. This decision to replicate the natural staff operational environment resulted in a long discovery process of constraints that were not initially foreseen. Requirements involving such matters as communications requirements, tactical operations center (TOC) replications, and BLUFOR (friendly forces) and OPFOR support considerations needed constant revision and updating as more experience was gained.

Phase 2. Designate Training Objectives

Activity 2.1 Identify task sources, tasks, and standards.

Early on, it was recognized that some unique problems existed when trying to define the task domain for staff sections. The primary problem is that the staff functions, as collective tasks, and particularly during mission execution, are not well codified in any source. This is particularly true of the staff interactions--the synchronization and integration of actions--that are essential to good staff execution. While several sources of developmental work were identified, we finally decided to stick with a single source of staff tasks: ARTEP 71-2-MTP, *Mission Training Plan for the Tank and Mechanized Infantry Battalion Task Force* (Department of the Army, 1988a).

The rejection of other sources was based on two factors. First, the merits of evolutionary work aside, the JMSE design was a *training* development program, not a *doctrine* development requirement. Second, because staff would be provided feedback on their performance, it was necessary that the tasks, performance measures, and standards be based on accepted doctrine and be based on material available to the unit as part of their training and preparation. Thus the decision to limit the task source to the ARTEP-MTP was not a difficult one, and this, in turn, defined the domain.

Activity 2.2 Refine task list for simulation support.

Because the participant unit in JMSE does not actually operate the technology (Janus), this refinement was not as big a factor as it might have been had the involvement with the technology been more direct. Nonetheless, the requirement to operate in a simulated TOC environment did restrict somewhat the tasks that could be trained. For example, it was impossible to select an initial CP location, or to break down, move, and set up the CP during the execution. Likewise, some of the long-term CSS activities, such as processing of replacement troops, could not be conducted. Though these and some other tasks were not screened strictly on the criteria of the capabilities of the technology, they were judged by reference to the simulation environment. The principle and the effect were the same.

As noted earlier, the technology was not available early in the project to do any type of hands-on performance screening of the tasks, so it was fortuitous that the training design did not rely heavily on tasks performed directly on the technology. Had that been the case, the preliminary technology refinement would have had to rely on engineering descriptions to perform this activity.

Activity 2.3 Select tasks that support mission.

In order to screen tasks by mapping them onto the mission, it was necessary to break out the *mission* tasks (movement to contact and defense in sector) into more discrete components. To do this, we first had to do some of the preliminary scenario design that is part of Phase 3. In this case, it was necessary to segment the missions by deciding what major events would occur in each mission. As a result, movement to contact was made up of four segments:

- Move Tactically
- Fight a Meeting Engagement
- Attack by Fire
- Consolidate/Reorganize

The defense in sector was composed of:

- Defend

- Cover Passage of Lines
- Withdraw Under Enemy Pressure
- Consolidate/Reorganize

This in turn allowed identification of the maneuver tasks and BOS tasks in ARTEP 71-2-MTP that supported these segments.

This segmenting process sometimes yielded tasks that were too broad in coverage to be meaningful. It was necessary to go into the ARTEP-MTP at the subtask and even at the performance measure (standard) level to select statements that pertained to staff actions. However, not all staff activities were selected. As noted, the decision was made to have the exercise encompass only staff activities during the execution phase of the battle, while the majority of staff activities occur during the planning phase. Thus it became more selective than just choosing staff activities; the choice had to identify those activities that were germane only to the execution phase.

For JMSE, this first phase screening process was actually a series of smaller screening steps designed to bring the task definition down to a manageable level and to stay within the exercise constraints. The process required a general knowledge of the missions, ARTEP-MTP structure, and staff functions at battalion level.

Task screening did not stop with this phase. As development of the scenarios and exercises continued, it was decided, for a variety of reasons, to downplay the close air support (CAS) role at battalion level. Thus, at a later stage of development of the scenario in Phase 3, it was necessary to come back and to delete from the task list those staff activities that dealt with the employment of CAS. At another point, the role of the commander became clarified. While he still continued to play an important role as the foil for the staff's activities, it became clear that for the exercise to remain focused on the staff it would have to minimize the attention paid to commander's decisions and interventions. Therefore all tasks that were specifically focused on the commander, as an individual, were later deleted from the list of training tasks.

Phase 3. Design Scenario and Exercise Outline

The activities in this phase were performed in an iterative manner rather than independently. Additionally, much of the preliminary design had to be modified as a result of experience with running the exercises. The primary result was that the design and detail of the OPFOR and higher headquarters (brigade) had to be considerably reinforced.

JMSE is an interactive design. The controllers who are replicating subordinate and supporting units on the Janus react and interact with both what they see on their screens and with what the staff and the commander are telling them. Moreover, the JMSE missions are long exercises, requiring about two hours actual simulator time for Movement to Contact and about three hours for Defend in Sector. Finally, the options, choices, and branch possibilities

are very complex at battalion level . As evidence, during many replications of JMSE, the exercises have never been run exactly the same way twice. The result is that JMSE comprises much more free-play than do the other parts of RCVTP. It still meets the criteria of structured training, but has comparatively less rigid constructs than lower echelon, shorter duration exercises.

Given the focus of JMSE in the staff training scheme (i.e., that it assumes individual competency and that it is a complete battle exercise), there was no attempt to order the tasks. A "natural order" was used. The nature of the exercises gives ample opportunity for repeat performance on tasks.

Activity 3.1. Design training unit's mission.

The design of the unit's mission, insofar as the tactical battle was concerned, was relatively easy. Working with the overall mission and the ARTEP-MTP and segmenting the battalion's activities as described in Phase 2, provided the framework of the conduct of the ground operation. What was more complex was translating this into *staff* missions. There is a significant pre-operation phase for the staff, during which they assimilate intelligence updates; plot their own assets' locations, status, and activities; post status boards; and plot combat support requirements and requests. Likewise, the staff has a significant post-operation role in the Consolidation/Reorganization phase. In fact, one of the goals of JMSE became to *force* the Consolidation/Reorganization to happen. It had become a training concern that the focus was always on the immediate maneuver aspects of the battle without sufficient emphasis on the CSS reporting and planning requirements that must occur during these final segments.

Activity 3.2. Design higher-order mission.

The requirements for the design of the higher order unit requirement went far beyond the brigade OPORD and designation of the brigade area of operations (AO) on the terrain for the specified mission. Because staffs need to track adjacent units' operations and rely on intelligence input from adjacent units, it became a requirement to "play-out" the operations of the entire brigade including the activities of the adjoining battalion and the reserve battalion. Because the other flank unit was in an adjacent brigade's AO, that unit had to be wargamed out as well, and it had to be done under the aegis of the parent division.

It is inherent in the activities of the battalion staff that they must interact with brigade. While this is true of all subordinate units, it is a more complex operation at this level, involving staffs, multiple nets, and separate CSS organizations. It was discovered early in the JMSE development that this complexity meant that more attention had to be given to the details of the entire brigade operation. Moreover, some staff tasks could be insured to occur only if brigade initiated or required certain actions. The whole situation was exacerbated by the fact that the higher the headquarters, the fewer control persons exist with actual experience to role play those headquarters personnel with conviction. In the case of JMSE, it became necessary to prepare not only scripted message traffic to insure compliance with the

brigade/division order but also to prepare extensive guidance to deal with unscripted and unpredictable situations.

Activity 3.3. Prepare exercise context and specifications.

For most of the JMSE scenario development, this was a seamless continuation of the efforts in the preceding activity (3.2). However, it was under this activity that specific attention was devoted to the need for defining the exercise context of the OPFOR. The OPFOR in a battalion-level exercise is a fairly large, complex organization, particularly in the defensive exercise where the OPFOR must attack with a numerical superiority consistent with OPFOR doctrine for the attack.

For this (and some other cogent reasons related to realistic portrayal) it was decided not to program or control the OPFOR unrealistically, nor to give the OPFOR an omniscient view of the battlefield or any behind-the-scenes information on BLUFOR actions. We wanted to produce an intelligent OPFOR who would act and react to what he saw BLUFOR doing on the battlefield and to how he interpreted BLUFOR's intent and options. At the same time, it was necessary that OPFOR conform scrupulously to OPFOR doctrine regarding times, distances, composition, and use of his force, as well as comply with the various intelligence estimates that had to be provided to the participating unit staff. This was necessary because the unit S2 will (or should) track and template the enemy based on expected doctrine of organization and deployment.

As a result of all these considerations, it was as necessary to dedicate as much attention to specification of the OPFOR scenario as it was to outlining the participating unit activities. Strict guidelines had to be prepared to insure that OPFOR doctrine was followed. At the same time, contingency plans, including differing courses of action based on BLUFOR actions, had to be prepared. OPFOR needed to have specified commander's intent, adjacent unit activities, reinforcement options, priority of fires, and decision points.

Activity 3.4. Outline events.

In the JMSE, the battalion staff performs many, many tasks and activities in the course of the exercise. No attempt was made to identify or capture all of the tasks, nor to identify all of the times a task could occur. Instead, the focus was on identifying a smaller set of tasks that would be known to occur based either on events (such as crossing or reaching a control feature) or on scripted message traffic (almost always from brigade) and to identify critical training objectives associated with these known activities. Other tasks could be handled generically, such as posting status boards, maintaining logs, posting maps, and adhering to communication security. The point was not to try to identify everything but to be selective and ensure meaningful and predictable observation and measurement of performance.

Phase 4. Develop Training Support Package

Activity 4.1. Prepare training support package components for the O/C/I.

The documentation required to support the administration and conduct of JMSE is extensive. An overall Training Guide covering the management of JMSE including the scheduling of JMSE, allocation of resources, site preparation, controller preparation, and unit preparation had to be developed.

During the execution of JMSE, there are two distinct O/C requirements: one is for *controllers* who are necessary to make events happen for the participant staff; the other is for *observers* who record events and provide feedback for the participants. For control of the exercise, individual Workbooks were required for:

- The JMSE Exercise Controller
- The Brigade Cell Controllers
- The Maneuver Controllers (Line companies/teams and scouts)
- The Roving First Sergeant (reports battle losses, casualties, fuel and ammo status on a rotating basis for all Maneuver Controllers)
- The Fire Support Controller (acts as brigade FSO, mortars, DS artillery battalion; handles all calls for fire and delivers all indirect fires on Janus)
- The Roving Company FSO (issues all calls for fire on a rotating basis for all Maneuver Controllers)
- The CS/CSS Controller (acts as the unit support platoon leader, the attached air defense artillery (ADA) platoon leader, and the attached engineer company commander)
- The OPFOR Cell Controllers

Additionally, Workbooks were required for the main CP observers--executive officer (XO), S3 Section (operations and training), S2 Section (intelligence), and FSS/FSO; and for the CTCF observer--S1 (adjutant)/S4 (supply), and Combat Trains.

Although the supporting documentation for controllers and observers in JMSE was extensive, a conscious effort was made to reduce to a minimum the amount of printed material provided, especially to the controllers. Part of the management responsibility stressed in the Training Guide was the requirement to prepare controllers well before the JMSE event. Providing persons at the operator level with overly comprehensive documentation can be counterproductive; the sheer volume almost insures it won't be read.

Instead, the emphasis in JMSE was to make persons at a *management* level responsible for implementing the written material.

Figure C-7 at the end of this section shows the Tables of Contents for one of these books.

Activity 4.2. Prepare training support package components for the unit.

The focus of JMSE on the execution phase of the combat operation meant that all planning activities had to be constructed and delivered to the unit staff. Thus the unit had to be provided with a full battalion OPORD with Annexes for Organization, Intelligence, Engineer, Fire Support, and Combat Service Support. The commander's intent was provided along with a decision support template for the staff. Overlays depicting control features, NAIs/TAIs, TRP, targets, and obstacles were also provided for the unit's use. A brigade OPORD, again with all supporting Annexes, was also provided to the unit.

The fact that the unit did *not* do the planning phase actually caused bigger problems for the unit; it is more difficult to internalize someone else's plan than it is if they had prepared their own. Thus it was necessary to furnish some extensive guidance on how the unit should prepare themselves before the JMSE event. This included a road map of the materials provided and suggested methods of staff wargaming and preparation. With RCVTP, the situation is compounded because of the limited joint training time at home station for RC units.

JMSE Exercise Controller Workbook

- Purpose
- JMSE Exercise Controller Exercise Guidelines
 - Before Exercise Checklist
 - During Exercise Checklist
 - After Exercise Checklist
 - JMSE Technical Checklist
- JMSE Controller's Workstation Operations
 - JEC Start Up of CONWOR
 - Using CONWOR During Exercise Execution
- Exercise Intervention
- Exercise Termination
- Movement to Contact Exercise
 - TF Organization
 - Initialization and Force Definition Worksheets
 - JMSE Site Layout
 - Exercise Training Event Matrix
- Defense in Sector Exercise
 - TF Organization
 - Initialization and Force Definition Worksheets
 - JMSE Site Layout
 - Exercise Training Event Matrix
- JMSE Signal Operation Instructions

C-7. Table of Contents for *JMSE Exercise Controller Workbook*.